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Date 2026
Algebra 2

CCA2 Common Regents Homework

18432

1. What is the completely factored form of $k^4 - 4k^2 + 8k^3 - 32k + 12k^2 - 48$?
   1) $(k-2)(k-2)(k+3)(k+4)$
   2) $(k-2)(k-2)(k+6)(k+2)$
   3) $(k+2)(k-2)(k+3)(k+4)$
   4) $(k+2)(k-2)(k+6)(k+2)$

2. What is the solution set of the equation $\frac{3x+25}{x+7} - 5 = \frac{3}{x}$?
   1) $\left\{\frac{3}{2}, 7\right\}$
   2) $\left\{\frac{7}{2}, -3\right\}$
   3) $\left\{-\frac{3}{2}, 7\right\}$
   4) $\left\{-\frac{7}{2}, -3\right\}$

$-\frac{7}{2}$ STO→ X
-3 STO→ X

3. Solve *graphically* for x: $\sqrt{x^2+x-1} + 11x = 7x + 3$

$y_1 = \sqrt{x^2+x-1} + 11x$
$y_2 = 7x+3$
Intersect

$x = .\overline{6}$

4. Stone Manufacturing has developed a cost model, $C(x) = 0.18x^3 + 0.02x^2 + 4x + 180$, where x is the number of sprockets sold, in thousands. The sales price can be modeled by $S(x) = 95.4 - 6x$ and the company's revenue by $R(x) = x \bullet S(x)$. The company's profits, $R(x) - C(x)$, could be modeled by
   1) $0.18x^3 + 6.02x^2 + 91.4x + 180$
   2) $0.18x^3 - 5.98x^2 - 91.4x + 180$
   3) $-0.18x^3 - 6.02x^2 + 91.4x - 180$
   4) $0.18x^3 + 5.98x^2 + 99.4x + 180$

$R(x) - C(x)$
$x(95.4 - 6x) - (.18x^3 + .02x^2 + 4x + 180)$
$95.4x - 6x^2 - .18x^3 - .02x^2 - 4x - 180$
$-.18x^3 - 6.02x^2 + 91.4x - 180$

→ you can use MC strategy at this point.

5. Given $f(x) = 3x^2 + 7x - 20$ and $g(x) = x - 2$, state the quotient and remainder of $\frac{f(x)}{g(x)}$, in the form $q(x) + \frac{r(x)}{g(x)}$.

$$\begin{array}{r|rrr} 2 & 3 & 7 & -20 \\ & \downarrow & 6 & 26 \\ \hline & 3 & 13 & 6 \end{array}$$

$3x+13+\frac{6}{x-2}$

6. Express the quotient of $\frac{x^4-2x^3+3x^2-4x+5}{x^2-2}$

$x^2-2x+5+\frac{-8x+15}{x^2-2}$

$$\begin{array}{l} x^2+0x-2 \,\big)\, x^4-2x^3+3x^2-4x+5 \\ \quad + \; -x^4 \mp 0x^3 + 2x^2 \\ \hline \quad -2x^3+5x^2-4x \\ \quad + \; +2x^3 \mp 0x^2 \mp 4x \\ \hline \quad 5x^2-8x+5 \\ \quad + \; -5x^2 \mp 0x + 10 \\ \hline \quad -8x+15 \end{array}$$

7. For $c(x) = 3x^2 - 4x + 7$ and $d(x) = x - 2$, determine $c(x) \bullet d(x) - [d(x)]^3$ as a polynomial in standard form.

$c(x)\cdot d(x)$

	$3x^2$	$-4x$	$+7$
x	$3x^3$	$-4x^2$	$+7x$
-2	$-6x^2$	$+8x$	-14

$3x^3-10x^2+15x-14$

$(3x^3-10x^2+15x-14)-(x^3-6x^2+12x-8)$

$3x^3-10x^2+15x-14-x^3+6x^2-12x+8$

$2x^3-4x^2+3x-6$

$[d(x)]^3$

$(x-2)(x-2)(x-2)$

	x	-2
x	x^2	$-2x$
-2	$-2x$	$+4$

x^2-4x+4

$(x^2-4x+4)(x-2)$

	x^2	$-4x$	$+4$
x	x^3	$-4x^2$	$+4x$
-2	$-2x^2$	$+8x$	-8

$x^3-6x^2+12x-8$

8. Is $x+2$ a factor of $p(x) = x^3 - 3x^2 - 8x + 4$? Justify your answer.

$P(-2) = (-2)^3 - 3(-2)^2 - 8(-2) + 4$

$P(-2) = 0$

Yes, the remainder is 0.

$p(1)=0$

9. If $x-1$ is a factor of $x^3 - kx^2 + 2x$, what is the value of k?

$0 = (1)^3 - k(1)^2 + 2(1)$

$0 = 1 - k + 2$

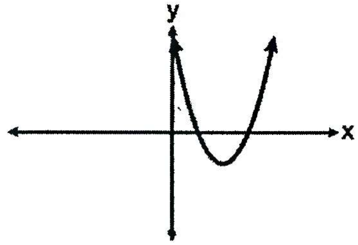
$0 = 3 - k$

$+k \quad +k$

$k = 3$

10. Which graph has imaginary roots? imaginary zeros don't hit the x-axis

1)



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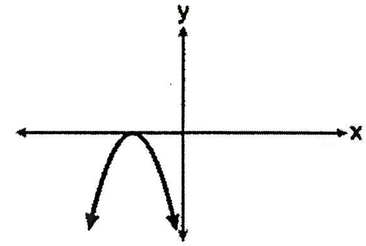

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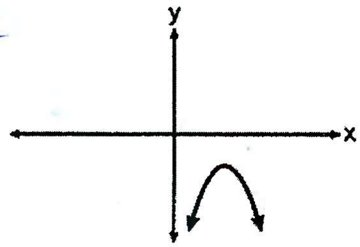

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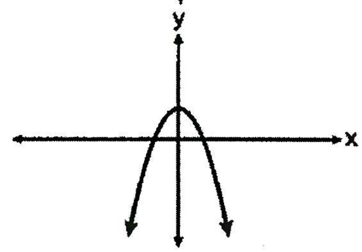
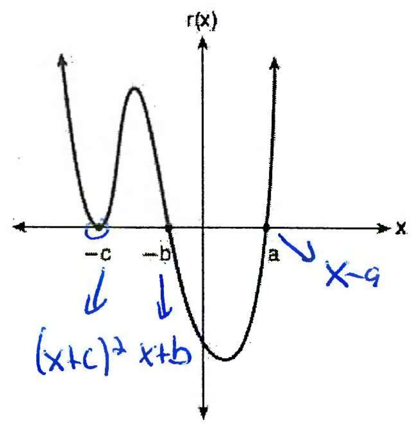


11. A sketch of $r(x)$ is shown below.



$x-a$

$(x+c)^2 \quad x+b$

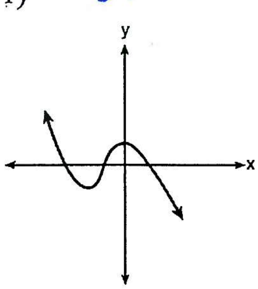
An equation for $r(x)$ could be

1) $r(x) = (x-a)(x+b)(x+c)$
2) $r(x) = (x+a)(x-b)(x-c)^2$
3) $r(x) = (x+a)(x-b)(x-c)$
4) $r(x) = (x-a)(x+b)(x+c)^2$

12. Which graph has the following characteristics?

- three real zeros
- as $x \to -\infty$, $f(x) \to -\infty$ (left, down)
- as $x \to \infty$, $f(x) \to \infty$ (right, up)

1)



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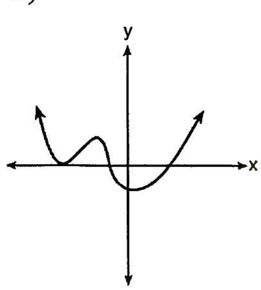

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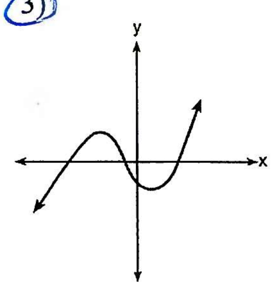

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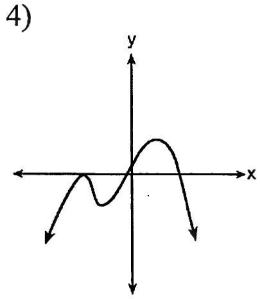


$i^2 = -1$ $\quad$ $i^3 = -i$

13. If x is a real number, express $2xi(i - 4i^2)$ in simplest $a + bi$ form.

$2xi^2 - 8xi^3$

$2x(-1) - 8x(-i)$

$-2x + 8xi$

14. If $f(x) = 3|x| - 1$ and $g(x) = 0.03x^3 - x + 1$, an approximate solution for the equation $f(x) = g(x)$ is

1) 1.96
2) 11.29
3) $(-0.99, 1.96)$
4) $(11.29, 32.87)$

$Y1 = 3|x| - 1$

$Y2 = .03x^3 - x + 1$

intersect

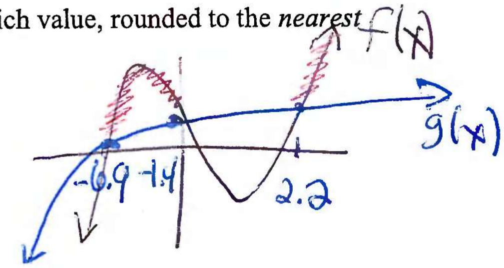
*adjust window

15. If $f(x) = \frac{1}{2}x^3 + 3x^2 - 4x$ and $g(x) = 5\log_3(x + 10)$, then which value, rounded to the *nearest tenth*, is a solution to $f(x) > g(x)$?

1) -7.0
2) -6.8
3) -1.1
4) 2.1

or

Substitute each one in



16. Which quadratic function has the largest maximum?

1) $h(x) = (3 - x)(2 + x)$ 6.25

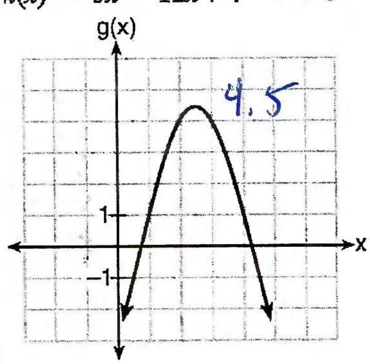
3) $k(x) = -5x^2 - 12x + 4$ 11.2

2)

x	f(x)
−1	−3
0	5
1	9
2	9
3	5
4	−3

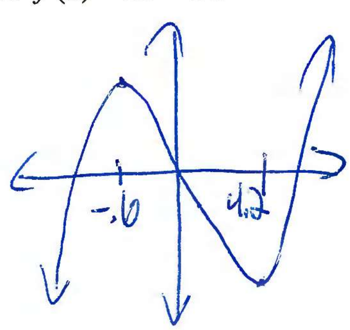
≈9.5

4)

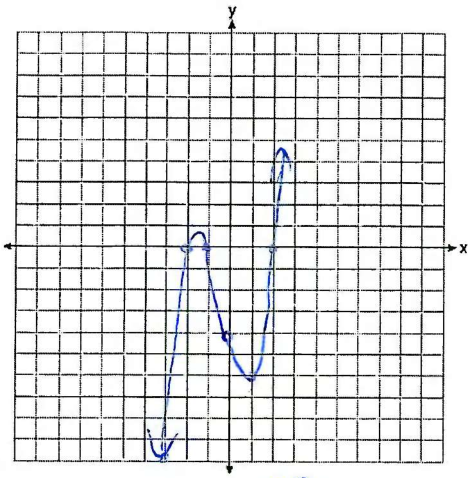


17. At which x value is the graph of $f(x) = 2x^3 - 11x^2 - 14x + 26$ *increasing*?

1) -.5
2) 3.9
3) 1.7
4) 4.3



18. Graph $p(x)=x^3+x^2-4x-4$ on the grid provided and fill in the end behavior



x	y
-3	-10
-2	0
-1	0
0	-4
1	-6
2	0

$x \to -\infty,\ f(x) \to -\infty$

$x \to \infty,\ f(x) \to \infty$

19. What is the inverse of $f(x) = -6(x-2)$?

switch x and y

1) $f^{-1}(x) = -2 - \frac{x}{6}$

2) $f^{-1}(x) = 2 - \frac{x}{6}$

3) $f^{-1}(x) = \frac{1}{-6(x-2)}$

4) $f^{-1}(x) = 6(x+2)$

$y = -6(x-2)$

$\frac{x}{-6} = \frac{-6(y-2)}{-6}$

$\frac{x}{-6} = y - 2$

$+2 \quad +2$

$\frac{x}{-6} + 2 = y$

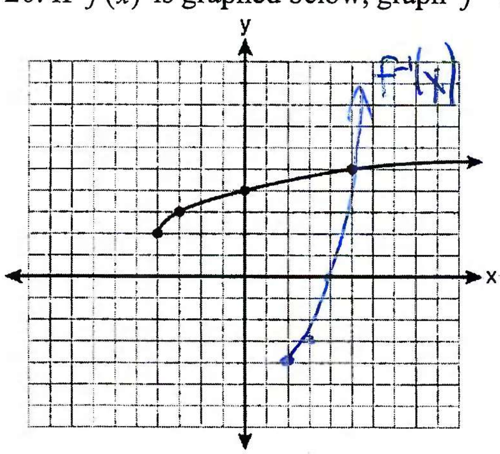
or

x	y
1	6
2	0
3	-6

$\to$

x	y
6	1
0	2
-6	3

20. If $f(x)$ is graphed below, graph $f^{-1}(x)$ on the same set of axes.

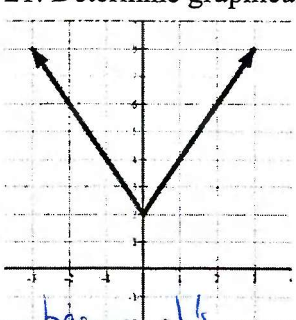


x	y
-4	2
-3	3
0	4
5	5

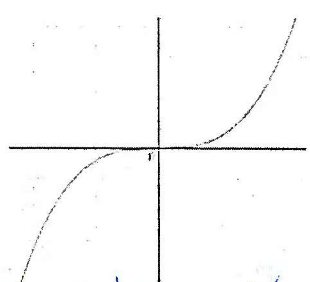
$\to$

x	y
2	-4
3	-3
4	0
5	5

21. Determine graphically whether the following functions are even, odd, or neither

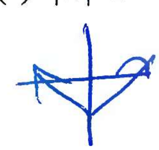


even because it's symmetric to y-axis



odd because it's symmetric to the origin

$f(x) = |x| - 3$



even because it's symmetric to the y-axis

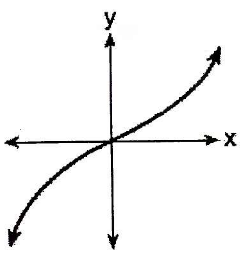
22. Given the parent function $p(x) = \cos x$, which phrase best describes the transformation used to obtain the graph of $g(x) = \cos(x + a) - b$, if a and b are positive constants?

1) right a units, up b units
2) right a units, down b units
3) left a units, up b units
4) left a units, down b units

left a

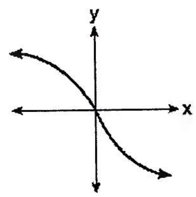
down b

23. The graph below represents f(x).

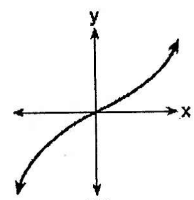


Which graph best represents f(-x)?

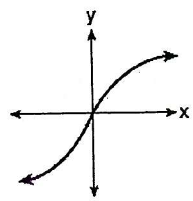
reflection over y-axis



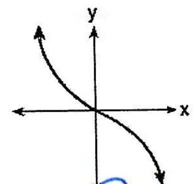
(1)



(3)



(2)



(4)

24. The function f(x) is given by the following table of values. Which table of values would represent g(x) if g(x) = f(2x)?

horizontal compression by $\frac{1}{2}$

x	f(x)
2 · $\frac{1}{2}$	18
4 · $\frac{1}{2}$	10
8 · $\frac{1}{2}$	2

1)

x	g(x)
2	36
4	20
8	4

2)

x	g(x)
1	18
2	10
4	2

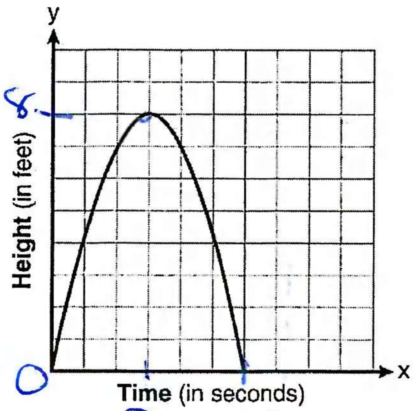
3)

x	g(x)
2	9
4	5
8	1

4)

x	g(x)
4	18
8	10
16	2

25. The graph below represents the parabolic path of a ball kicked by a young child. Find the average rate of change from 3 to 6 seconds. Explain its meaning in the context of the problem.



$\frac{y_2-y_1}{x_2-x_1}$

x	y
3	8
6	0

$\frac{0-8}{6-3} = -\frac{8}{3}$

On average, from 3 to 6 seconds, the height of the ball decreases by $\frac{8}{3}$ ft per second

26. Express in simplest form with a rational exponent:

$$\frac{x\sqrt[2]{x^3}}{\sqrt[3]{x^5}}$$

$$\frac{x^1\cdot x^{\frac{3}{2}}}{x^{\frac{5}{3}}} = \frac{x^{\frac{5}{2}}}{x^{\frac{5}{3}}} = x^{\frac{5}{6}}$$

$1+\frac{3}{2}=\frac{5}{2}$

$\frac{5}{2}-\frac{5}{3}=\frac{5}{6}$

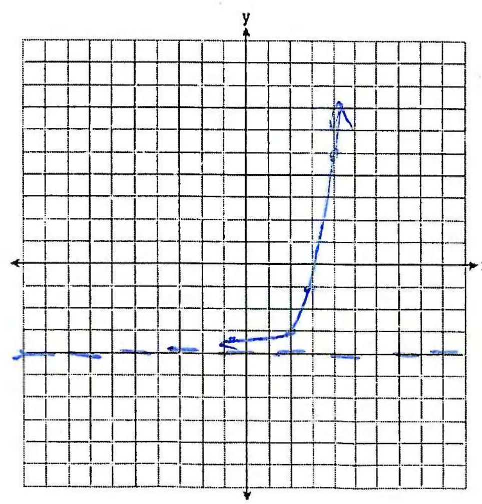
27. Graph $y = 3^{x-2} - 4$ on the axes provided and fill in the end behavior.

$x \to -\infty,\ f(x) \to -4$

$x \to \infty,\ f(x) \to \infty$

$y=-4$ asymptote

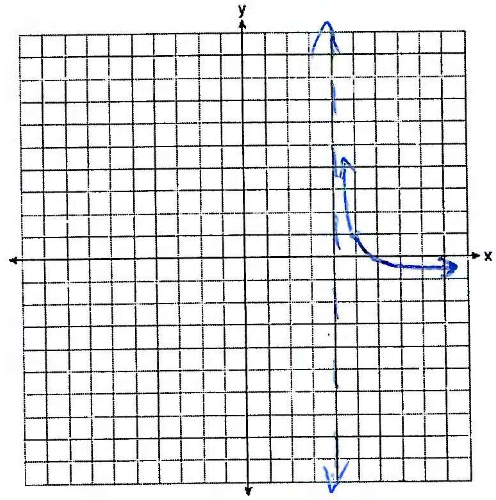
x	y
	-4
	-4
	-4
2	-3
3	-1
4	5



28. Graph $y=-\log_3(x-4)+1$ and fill in the end behavior

$x=4$
asymptote

X	Y
4	ERROR
5	1
7	0

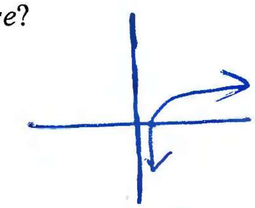


$x \to 4,\ f(x) \to \infty$

$x \to \infty,\ f(x) \to -\infty$

29. Which statement about the graph of $c(x) = \log_6 x$ is *false*?

1) The asymptote has equation $y = 0$.
2) The graph has no y-intercept.
3) The domain is the set of positive reals.
4) The range is the set of all real numbers.

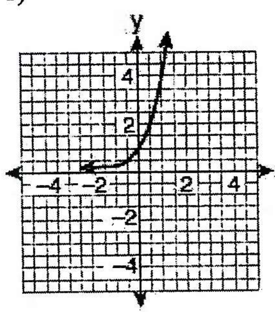


$x=0$

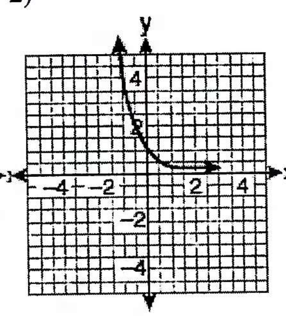
30. If a function is defined by the equation $f(x) = 4^x$, which graph represents the inverse of this function?

log

1)



2)



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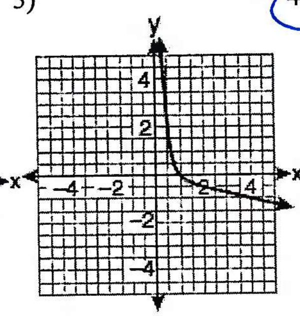

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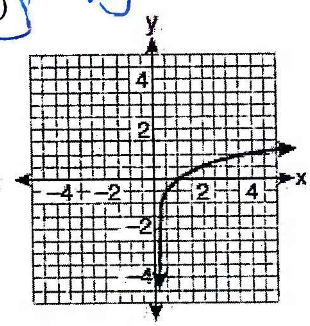
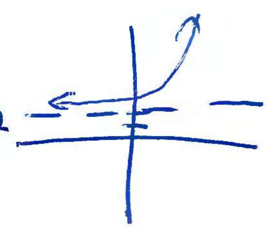


31. Given $f(x) = 3^{x-1} + 2$, as $x \to -\infty$

1) $f(x) \to -1$
2) $f(x) \to 0$
3) $f(x) \to 2$
4) $f(x) \to -\infty$

2



32. Solve for x rounding your answer to the *nearest hundredth*.

$8+2e^{-5x}=14$

$-8 \qquad -8$

$\frac{2e^{-5x}}{2}=\frac{6}{2}$

$e^{-5x}=3$

$\frac{-5x\ln e}{-5}=\frac{\ln 3}{-5}$

$x=-.22$

33. The concentration, y, in milligrams per liter, of a medication in a patient's bloodstream x hours after taking the medication is listed for specified values in the table below.

Time (hours) (x)	**Concentration** (mg/l) (y)
0	0
0.5	78.1
1	99.8
1.5	84.4
2	50.1
2.5	15.6

Quad Reg Stat, Edit

Write the equation of the quadratic regression that models these data, rounding all values to the *nearest tenth*. Based on your regression equation from above, determine the concentration in the patient's bloodstream 1.75 hours after the medication was taken, rounded to the *nearest tenth of a milligram per liter*.

$a = -56.2$ $\quad y = ax^2 + bx + c$

$b = 139.3$ $\quad y = -56.2x^2 + 139.3x + 9.4$

$c = 9.4$

$y = -56.2(1.75)^2 + 139.3(1.75) + 9.4$

$y = 81.1$

34. The stopping distances for Jim's car while driving at various speeds are shown in the table below.

x	**Speed** (mph)	10	15	20	25	30	40
y	**Stopping Distance** (ft)	12	22	39	58	84	150

PwrReg Stat, Edit

Based on these data, find the power regression equation for the set of data. Round all coefficients to the *nearest hundredth*. If Jim's car needs 100 feet of stopping distance, determine how fast Jim is driving, to the *nearest mile per hour*.

$y = a(x)^b$

$a = .16$ $\quad y = .16(x)^{1.83}$

$b = 1.83$

$100 = .16(x)^{1.83}$

$Y_1 = 100$

$Y_2 = .16(x)^{1.83}$

intersect

$X = 34$

Xadjust x max and y max

or

$\frac{100}{.16} = \frac{.16(x)^{1.83}}{.16}$ $\quad$ reciprocal power

$(625)^{\frac{1}{1.83}} = (x^{1.83})^{\frac{1}{1.83}}$

$34 = X$

35

33. Using a microscope, a researcher observed and recorded the number of bacteria spores on a large sample of uniformly sized pieces of meat kept at room temperature. A summary of the data she recorded is shown in the table below.

Hours (x)	Average Number of Spores (y)
0	4
0.5	10
1	15
2	60
3	260
4	1130
6	16,380

$y = a(b)^x$ $a = 4.167983971$ $b = 3.98619454$

$y = 4.168(3.981)^x$

Exp Reg

Using these data, write an exponential regression equation, rounding all values to the *nearest thousandth*. The researcher knows that people are likely to suffer from food-borne illness if the number of spores exceeds 100. (y) Using the exponential regression equation, determine the maximum amount of time, to the *nearest hundredth*, that the meat can be kept at room temperature safely.

$\frac{100}{4.168} = \frac{4.168(3.981)^x}{4.168}$

$\log 23.99... = \log 3.981^x$

$\cancel{x\log 3.9}$ $\frac{\log 23.99.}{\log 3.981} = \frac{x\log 3.981}{\log 3.981}$

$2.30 = x$

36

34. The Fahrenheit temperature, $F(t)$, of a heated object at time t, in minutes, can be modeled by the function below. F_s is the surrounding temperature, F_0 is the initial temperature of the object, and k is a constant.

$$F(t) = F_S + (F_0 - F_S)e^{-kt}$$

Coffee at a temperature of F_0 195°F is poured into a container. The room temperature is kept at a constant 68°F F_s and $k = 0.05$. Coffee is safe to drink when its temperature is, at most, 120°F. To the *nearest minute*, how long will it take until the coffee is safe to drink? F(t)

F(t) = temperature of object = 120

t = minutes = t

Fs = surrounding temp = 68

Fo = initial temp = 195

k = constant = .05

$120 = 68 + (195 - 68)e^{-.05t}$

$-68 \quad -68$

$\frac{52}{127} = \frac{127e^{-.05t}}{127}$

$\ln\frac{52}{127} = \ln e^{-.05t}$

$\frac{\ln\frac{52}{127}}{-.05} = \frac{-.05t\ln e}{-.05}$

$18 = t$

37 ~~35~~. The population of Schlansky, Arizona increases by 14% every 5.1 years. If the population is currently 2150, write an equation for $p(t)$, the population after t years. Using your equation, what will be the population, to the *nearest person*, 11 years from now?

h illegular time

$A = p(t)$
$P = 2150$
$r = .14$
$t = t$
$h = 5.1$

$A = P(1 \pm r)^{\frac{t}{h}}$

$p(t) = 2150(1+.14)^{\frac{t}{5.1}}$

$p(11) = 2150(1.14)^{\frac{11}{5.1}}$

$p(11) = 2852$

38 ~~36~~. A bank account is opened with \$2200 and interest is compounded continuously at a rate of 2.76% per year. Write an equation for $b(t)$, the balance of the account after t years. Using your equation, what will be the balance of the account after 7 years?

$A = b(t)$
$P = 2200$
$r = .0276$
$t = t$

$A = Pe^{rt}$

$b(t) = 2200e^{.0276t}$

$b(7) = 2200e^{.0276(7)}$

$b(7) = 2668.88$

39 ~~37~~. A certain car depreciates at a rate of 12% each year. If the car was initially worth \$22,100, write an equation for $v(t)$, the value of the account after t years. Using your equation, to the *nearest tenth of a year*, how long will it take for the value of the car to reach \$2,500?

nothing below ~~A~~ A 0

$A = v(t)$
$P = 22{,}100$
$r = .12$
$t = t$

$A = P(1 \pm r)^t$

$v(t) = 22{,}100(1-.12)^t$

$v(t) = 22{,}100(.88)^t$

$\frac{2500}{22{,}100} = \frac{22{,}100(.88)^t}{22{,}100}$

$\log .113\ldots = \log .88^t$

$\frac{\log .113}{\log .88} = \frac{t\log .88}{\log .88}$

$17.0 = t$

half life

40

38. The half life of an element is 71 minutes. If there were initially 6.4 kg of the substance, write an equation for $a(t)$, the amount of the substance remaining after t minutes. Using your equation, to the *nearest hundredth of a kg*, how much will remain after 102 minutes?

$A = a(t)$
$P = 6.4$
$t = t$
$h = 71$

$A = P\left(\frac{1}{2}\right)^{\frac{t}{h}}$

$a(t) = 6.4\left(\frac{1}{2}\right)^{\frac{t}{71}}$

$a(102) = 6.4\left(\frac{1}{2}\right)^{\frac{102}{71}}$

$a(102) = 2.36$

41

39. A bank account is opened with \$2000 and interest is compounded quarterly at an interest rate of 3.5%. Write an equation for $b(t)$, the balance of the account after t years. Using your equation, to the *nearest year*, how long will it take for the balance of the account to double?

n formula $n=4$

$A = 2(2000)$

$A = b(t)$
$P = 2000$
$r = .035$
$n = 4$
$t = t$

$A = P\left(1+\frac{r}{n}\right)^{nt}$

$b(t) = 2000\left(1+\frac{.035}{4}\right)^{4t}$

$b(t) = 2000(1.00875)^{4t}$

$\frac{2(2000)}{2000} = \frac{2000(1.00875)^{4t}}{2000}$

$\log 2 = \log 1.00875^{4t}$

$\frac{\log 2}{4\log 1.00875} = \frac{4t\log 1.00875}{4\log 1.00875}$

$20 = t$

42

40. Jack bought a new car in 2010 for \$16100. In 2018, the car is now worth \$6125. What is the annual rate of decrease to the *nearest percent*? $\cdot 100$

nothing below

OG

$A = P(1 \pm r)^t$

$A = 6125$
$P = 16100$
$r = r$
$t = 8$

$\frac{6125}{16100} = \frac{16100(1-r)^8}{16100}$

$\sqrt[8]{.38\ldots} = \sqrt[8]{(1-r)^8}$

$.886 - 1 = 1 - r - 1$

$\frac{-.1137\ldots}{-1} = \frac{-r}{-1}$

$.1137\ldots(100) = r$

$11.37\ldots = r$

11

43. Tage deposits \$2500 into an account that earns 2.7% interest compounded continuously. Which inequality can be used to determine how long it will take for his account to have at least \$4000?

1) $2500(1.027)^t \leq 4000$
2) $2500(1.027)^t \geq 4000$
3) $2500e^{.027t} \leq 4000$
4) $2500e^{.027t} \geq 4000$

$Pe^{rt} \geq 4000$

$2500e^{.027t} \geq 4000$

44. An equation to represent the value of a car after t months of ownership is $v = 32,000(0.81)^{\frac{t}{12}}$. Which statement is *not* correct?

1) The car lost approximately 19% of its value each month. lost 2%
2) The car maintained approximately 98% of its value each month.
3) The value of the car when it was purchased was \$32,000.
4) The value of the car 1 year after it was purchased was \$25,920.

$V=32,000(.81^{\frac{1}{12}})^t$

$V=32,000(.98)^t$

45. A study of the annual population of the red-winged blackbird in Ft. Mill, South Carolina, shows the population, $B(t)$, can be represented by the function $B(t) = 750(1.16)^t$, where the t represents the number of years since the study began. In terms of the monthly rate of growth, the population of red-winged blackbirds can be best approximated by the function

1) $B(t) = 750(1.012)^t$
3) $B(t) = 750(1.012)^{12t}$
2) $B(t) = 750(1.16)^{12t}$
4) $B(t) = 750(1.16)^{\frac{t}{12}}$

$1.16^{\frac{1}{12}} = 1.012$

how many times per year do you get the monthly rate?

46. The value of a home after t years can be modeled by the function $A=525000(1.36)^t$ after t years. Which function would represent the monthly rate of increase after m months?

1) $A=525000(1.36)^m$
3) $A=525000(1.026)^m$
2) $A=525000(1.36)^{12m}$
4) $A=525000(1.026)^{12m}$

$1.36^{\frac{1}{12}}=1.026$

how many times per month do you get the monthly rate?

47. Cameron's YouTube video currently has 1200 views and can be modeled by the expression $1200(1.102)^d$ where d represents days. Which expression represents the weekly rate after t weeks.

1) $1200(1.9737)^t$
3) $1200(1.0140)^t$
2) $1200(1.9737)^{\frac{t}{7}}$
4) $1200(1.0140)^{\frac{t}{7}}$

$1.102^7 = 1.9737$

how many times per week do you get the weekly rate?

48. Rose's bank account has been increasing according to the equation $A = 7500(1.0098)^w$ where w represents weeks. Which of the following equations can be used to find the yearly growth rate after w weeks?

1) $A = 7500(1.0002)^{52}$
3) $A = 7500(1.6605)^{\frac{w}{52}}$
2) $A = 7500(1.0002)^{\frac{w}{52}}$
4) $A = 7500(1.6605)^w$

$1.0098^{52} = 1.6605$

how many times per week do you get the yearly rate?

49. The values below represent the cost of an ice cream sundae with one through four toppings. Write an explicit and recursive formula for a sequence that can be used to determine the cost of an ice cream cone with n toppings.

+.75 +.75 +.75

$4.75 $5.50 $6.25 $7.00

recursive

$a_1 = 4.75$

$a_n = a_{n-1} + .75$

explicit (reference sheet)

$a_n = a_1 + d(n-1)$

$a_n = 4.75 + .75(n-1)$

~~50.~~ A recursive formula for the sequence 40, 30, 22.5, . . . is

$\frac{30}{40} = \frac{3}{4}$

$\frac{22.5}{30} = \frac{3}{4}$

1) ~~$g_n = 40\left(\frac{3}{4}\right)^n$~~ ← not recursive →

3) ~~$g_n = 40\left(\frac{3}{4}\right)^{n-1}$~~

2) $g_1 = 40$

$g_n = g_{n-1} - 10$

4) $g_1 = 40$

$g_n = \frac{3}{4} g_{n-1}$

51. Find the first 4 terms of the recursive sequence $a_1 = -3$, $a_n = 4 - 3a_{n-1}$

$a_2 = 4 - 3(-3)$ $a_3 = 4 - 3(13)$ $a_4 = 4 - 3(-35)$

$a_2 = 13$ $a_3 = -35$ $a_4 = 109$

→ decreasing by 25%

52. The sequence defined by $r_1 = 15$ and $r_n = 0.75r_{n-1}$ best models which scenario?

1) Gerry's $15 allowance is increased by $0.75 each week.
2) A store that has not sold a $15 item reduces the price by $0.25 each week until someone purchases it.
3) A 15-gram sample of a chemical compound decays at a rate of 75% per hour.
4) A picture with an area of 15 square inches is reduced by 25% over and over again to make a proportionally smaller picture.

53. Alexa earns $33,000 in her first year of teaching and earns a 4% increase in each successive year. Find Alexa's total earnings for her first 15 years of teaching, to the *nearest cent.*

a_1 1.04 n

$$S_n = \frac{a_1(1-r^n)}{1-r}$$

$a_1 = 33{,}000$
$r = 1.04$
$n = 15$

$$S_{15} = \frac{33{,}000(1-1.04^{15})}{1-1.04}$$

$$S_{15} = 660{,}778.39$$

54. Kristin wants to increase her running endurance. According to experts, a gradual mileage increase of 10% per week can reduce the risk of injury. If Kristin runs 8 miles in week one, which expression can help her find the total number of miles she will have run over the course of her 6-week training program?

1.1 a_1 n

1) $\sum_{n=1}^{6} 8(1.10)^{n-1}$

2) $\sum_{n=1}^{6} 8(1.10)^{n}$

3) $\cancel{\dfrac{8-8(1.10)^6}{0.90}}$

4) $\cancel{\dfrac{8-8(0.10)^n}{1.10}}$

$$S_n = \sum_{k=1}^{n} a_1(r)^{k-1} \qquad \sum_{k=1}^{6} 8(1.1)^{k-1}$$

$$S_n = \frac{a_1(1-r^n)}{1-r} \qquad \frac{8(1-1.1^n)}{1-1.1}$$

+3 +3

55. Find the sum of the first 20 terms of the sequence 4 + 7 + 10 + 13 + …

$$S_n = \frac{n(a_1+a_n)}{2}$$

$$S_{20} = \frac{20(4+61)}{2}$$

$$S_{20} = 650$$

$a_n = a_1 + d(n-1)$
$a_{20} = 4 + 3(20-1)$
$a_{20} = 61$

56. Using the formula below, determine the monthly payment on a 5-year car loan with a monthly percentage rate of 0.625% for a car with an original cost of $21,000 and a $1000 down payment, to the *nearest cent.*

$$P_n = PMT\left(\frac{1-(1+i)^{-n}}{i}\right)$$

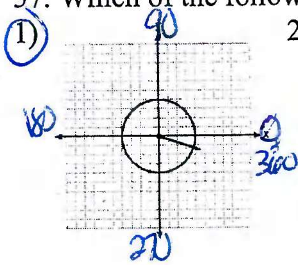
P_n = present amount borrowed $= 21{,}000 - 1{,}000 = 20{,}000$
n = number of monthly pay periods $= 12(5) = 60$
PMT = monthly payment $= x$
i = interest rate per month $= .00625$

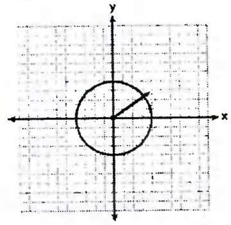
$$20{,}000 = x\left(\frac{1-(1+.00625)^{-60}}{.00625}\right)$$

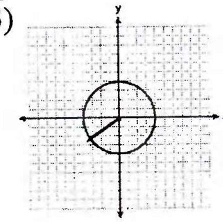
$$\frac{20{,}000}{49.9\ldots} = \frac{x(49.9\ldots)}{49.9}$$

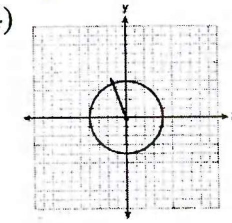
$$400.76 = x$$

57. Which of the following sketches would represent 6 radians? $6 \cdot \frac{180}{\pi} \approx 343$

1)


2)


3)


4)


58. What is the exact value of $\cos\left(\frac{3\pi}{4}\right)$? $= -.707..$

1) $\frac{\sqrt{3}}{2}$

2) $\frac{\sqrt{2}}{2}$

3) $-\frac{\sqrt{3}}{2}$

4) $-\frac{\sqrt{2}}{2}$

59. Angle θ is in standard position and (-2,3) is a point on the terminal side of θ. Find:

a) $\cos \vartheta$ $-\frac{2}{\sqrt{13}}$

b) $\sin \vartheta$ $\frac{3}{\sqrt{13}}$

c) $\tan \vartheta$ $-\frac{3}{2}$

S A T C

3 $\sqrt{13}$ 2

d) $\sec \vartheta$ $-\frac{\sqrt{13}}{2}$

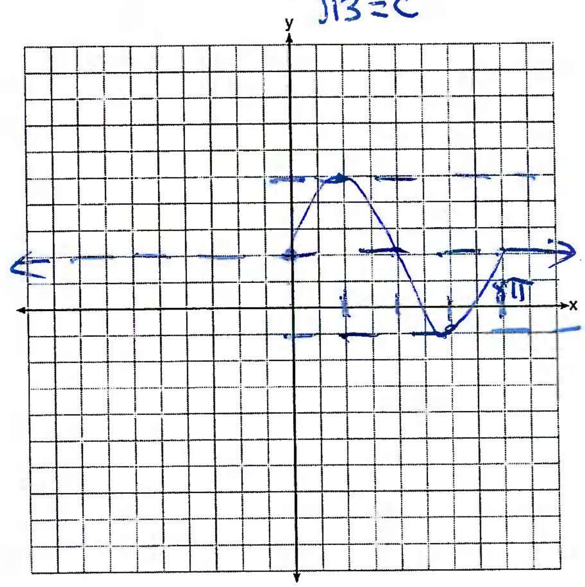
e) $\csc \vartheta$ $\frac{\sqrt{13}}{3}$

f) $\cot \vartheta$ $-\frac{2}{3}$

$a^2+b^2=c^2$
$2^2+3^2=c^2$
$\sqrt{4+9}=\sqrt{c^2}$
$\sqrt{13}=c$

ampsinbxmid

60. Graph one cycle of $y = 3\sin\frac{1}{4}x + 2$ on the accompanying set of axes



amp = 3
+sin
$b = \frac{1}{4}$
midline = 2
$p = \frac{2\pi}{b}$
$p = \frac{2\pi}{\frac{1}{4}}$
$p = \frac{2\pi}{1} \cdot \frac{4}{1} = 8\pi$

ampsinbxmid

61. Graph $y=-2\cos\frac{\pi}{5}x+1$ over the interval $[0,20]$

amp=2

$-\cos$

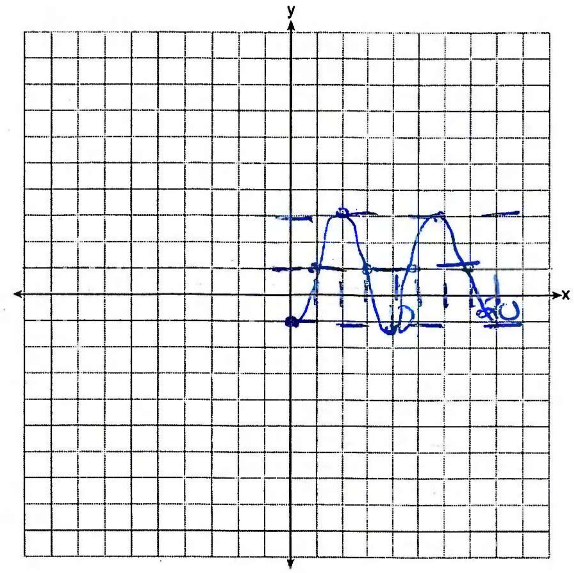
$b=\frac{\pi}{5}$

midline=1

$p=\frac{2\pi}{b}$

$p=\frac{2\pi}{\frac{\pi}{5}}$

$p=\frac{2\pi}{1}\cdot\frac{5}{\pi}=10$



62. The depth of the water at a marker 20 feet from the shore in a bay is depicted in the graph below.

If the depth, d, is measured in feet and time, t, is measured is an equation for the depth of the water at the marker?

1) $d=5\cos\left(\frac{\pi}{6}t\right)+9$

2) $d=9\cos\left(\frac{\pi}{6}t\right)+5$

3) $d=9\sin\left(\frac{\pi}{6}t\right)+5$

4) $d=5\sin\left(\frac{\pi}{6}t\right)+9$

$b=\frac{2\pi}{p}$

$b=\frac{2\pi}{12}$

$b=\frac{\pi}{6}$

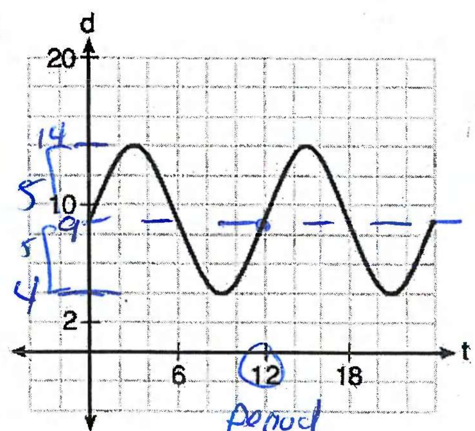
$mid=\frac{min+max}{2}$

$mid=\frac{4+14}{2}$

$mid=9$

$y=ampsinbxmid$

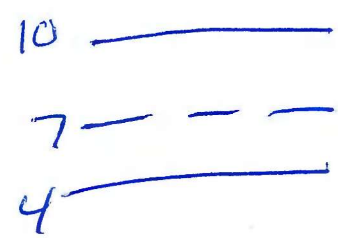
$y=5\sin\frac{\pi}{6}x+9$



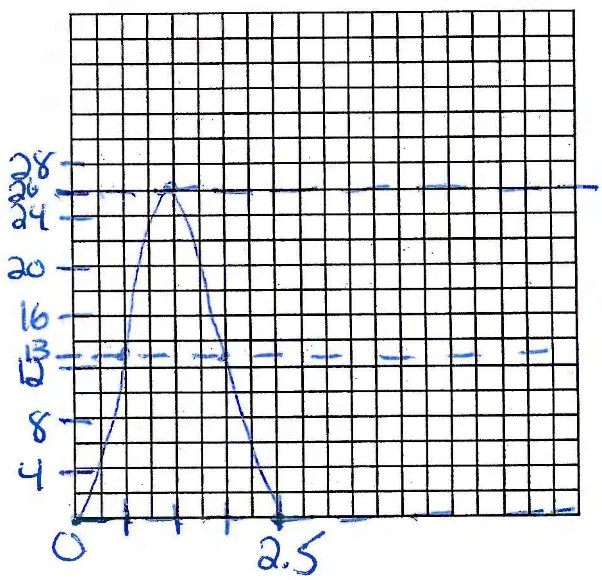
ampsinbxmid

63. Which statement is *incorrect* for the graph of the function $y=-3\cos\left[\frac{\pi}{3}(x-4)\right]+7$?

1) The period is 6.
2) The amplitude is 3.
3) The range is [4,10].
4) The midline is $y=-4$.



64. Griffin is riding his bike down the street in Churchville, N.Y. at a constant speed, when a nail gets caught in one of his tires. The height of the nail above the ground, in inches, can be represented by the trigonometric function $f(t) = -13\cos(0.8\pi t) + 13$, where t represents the time (in seconds) since the nail first became caught in the tire. Determine the period of $f(t)$. Interpret what the period represents in this context. On the grid below, graph *at least one* cycle of $f(t)$ that includes the y-intercept of the function.



$f(t) = -13\cos(0.8\pi t) + 13$

amp = 13

− cos

$b = 0.8\pi$

mid = 13

$p = \frac{2\pi}{0.8\pi}$

$p = 2.5$

26 ______

13 — — —

0 ______

Period = 2.5

It takes 2.5 seconds for the bike wheel to complete one full rotation.

65. The depth of the water, $d(t)$, in feet, on a given day at Thunder Bay, t hours after midnight is modeled by $d(t) = 5\sin\left(\frac{\pi}{6}(t-5)\right) + 7$. What is the frequency of this function?

b

$f = \frac{b}{2\pi}$ $f = \frac{\frac{\pi}{6}}{\frac{2\pi}{1}}$ $\frac{\pi}{6} \cdot \frac{1}{2\pi} = \frac{1}{12}$

1) 12

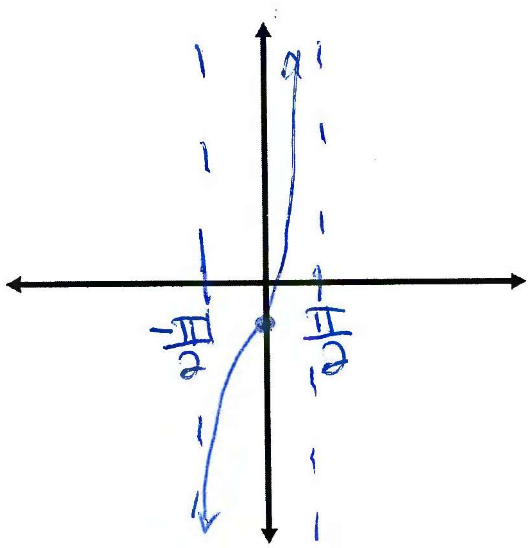
2) $\frac{1}{12}$

3) $\frac{\pi}{6}$

4) $\frac{6}{\pi}$

66. Graph one full cycle of $y = 2\tan x - 1$

x	y
0	−1



67. As θ increases from π to $\frac{3\pi}{2}$ radians, the graph of $y = \sin\theta$ will

y= sin x
window: x min: π
x max: $\frac{3\pi}{2}$

1) Decrease from 1 to 0
2) Decrease from 0 to -1
3) Increase from -1 to 0
4) Increase from 0 to 1

68. Given: A = {2, 3, 5, 6, 8, 11, 15, 17, 19}
B = {4, 5, 6, 9, 15, 18}

intersection is both

a) What is $A \cap B$?

{5,6,15}

union is all together

b) What is $A \cup B$?

{2,3, 4,5,6,8,9,11,15,17,18,19}

69. Given: Set $U = \{S, O, P, H, I, A\}$
Set $B = \{A, I, O\}$

the complement is everything else

If set B is a subset of set U, what is the complement of set B?

1) $\{O, P, S\}$
2) $\{I, P, S\}$
3) $\{A, H, P\}$
4) $\{H, P, S\}$

70. The probability of event A is .27. The probability of event B is .36. The probability of both events happening is .11. What is the probability that event A or event B happens?

reference sheet

$P(A \cup B) = P(A) + P(B) - P(A \cap B)$
$P(A \cup B) = .27 + .36 - .11$
$P(A \cup B) = .52$

71. The probability of event A happening is 14% and the probability of event B happening is 18%, The probability that event A or event B happens is 20%. What is the probability that event A and event B happens?

reference sheet

$P(A \cap B) = P(A) + P(B) - P(A \cup B)$
$P(A \cap B) = .14 + .18 - .2$
$P(A \cap B) = .12$

72. On a given school day, the probability that Nick oversleeps is 48% and the probability he has a pop quiz is 25%. Assuming these two events are independent, what is the probability that Nick oversleeps and has a pop quiz on the same day?

Reference Sheet

$p(A \cap B) = p(A) \cdot p(B)$

$p(A \cap B) = .48 \cdot .25$

$p(A \cap B) = .12$

73. A public opinion poll was taken to explore the relationship between age and support for a candidate in an election. The results of the poll are summarized in the table below.

Age	For	Against	No Opinion	
21–40	30	12	8	50
41–60	20	40	15	75
Over 60	25	35	15	75
	75	87	38	200

What is the probability that someone is 41-60 given that they have no opinion?

$\frac{15}{38}$

total total

What is the probability that someone is over 60 and against the candidate?

$\frac{35}{200}$

What is the probability that someone is for the candidate?

$\frac{75}{200}$

No keywords

What percent of the 21-40 age group was for the candidate?

$\frac{30}{50} = .6 = 60\%$

74

64. The results of a poll of 200 students are shown in the table below:
For this group of students, do these data suggest that "female" and "techno" are independent of each other? Justify your answer.

B

	Preferred Music Style		
	Techno	**Rap**	**Country**
A **Female**	54	25	27
Male	36	40	18

106
94
90 65 45 200

$P(A \cap B) = P(A) \cdot P(B)$

$\frac{54}{200} = \frac{106}{200} \cdot \frac{90}{200}$

$\frac{27}{100} \neq \frac{477}{2000}$

Not Indipendent

75

65. A fast-food restaurant analyzes data to better serve its customers. After its analysis, it discovers that the events D, that a customer uses the drive-thru, and F, that a customer orders French fries, are independent. The following data are given in a report:

$P(F) = 0.8$

$P(F \cap D) = 0.456$

Given this information, $P(F|D)$ is

1) 0.344
2) 0.3648
3) 0.57
4) 0.8

$P(A) = P(A|B)$

$P(F) = P(F|D)$

76

2nd VARS normalcdf

66. The heights of women in the United States are normally distributed with a mean of 64 inches and a standard deviation of 2.75 inches. Out of 250 women, to the *nearest woman*, how many would be expected to be taller than 69 inches?

lower

lower: 69
upper: 9999999
μ: 64
σ: 2.75

.034 . (250)

$\boxed{9}$

77

67. A doctor wants to test the effectiveness of a new drug on her patients. She separates her sample of patients into two groups and administers the drug to only one of these groups. She then compares the results. Which type of study *best* describes this situation?

1) census
2) survey
3) observation
4) controlled experiment

78

68. A survey is being conducted about American's favorite musicians. Which of the following survey methods would most likely produce a random sample?

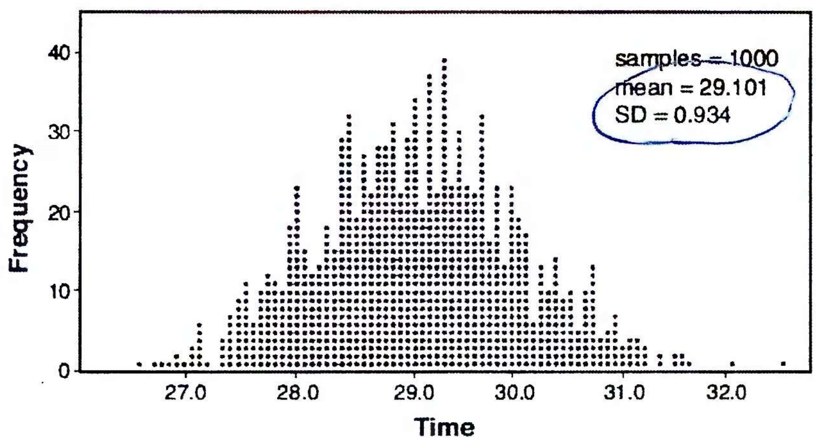
1) Asking every 20th person at a Green Day concert bias
2) Asking every 10th person at a vintage record store bias
3) Asking every 10th person at the Westbury Public Library bias
4) Sending out surveys to random households across the country.

79

69. A radio station claims to its advertisers that the mean number of minutes commuters listen to the station is 30. The station conducted a survey of 500 of their listeners who commute. The sample statistics are shown below.

$\bar{x}$	29.11
s_x	20.718

A simulation was run 1000 times based upon the results of the survey. The results of the simulation appear below.



Based on the simulation results, is the claim that commuters listen to the station on average 30 minutes plausible? Explain your response including an interval containing the middle 95% of the data, rounded to the *nearest hundredth*.

Find the confidence interval (27.23, 30.97)

CI = mean ± 2(SD)

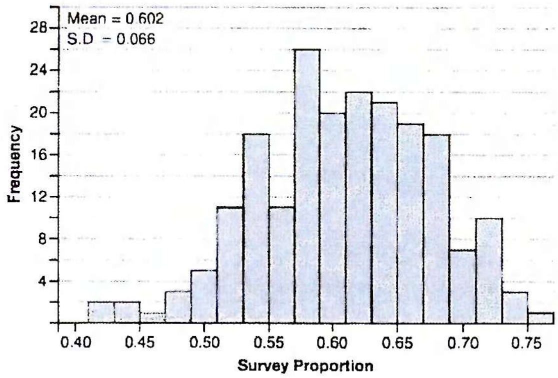
= 29.101 + 2(.934) = 30.97

29.101 − 2(.934) = 27.23

Yes, 30 is inside the confidence interval

~~70~~ 80. Fifty-five students attending the prom were randomly selected to participate in a survey about the music choice at the prom. Sixty percent responded that a DJ would be preferred over a band. Members of the prom committee thought that the vote would have 50% for the DJ and 50% for the band. A simulation was run 200 times, each of sample size 55, based on the premise that 60% of the students would prefer a DJ. The approximate normal simulation results are shown below.

Using the results of the simulation, determine the margin of error rounded to the *nearest hundredth.*

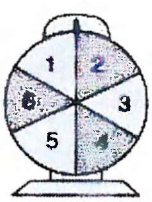


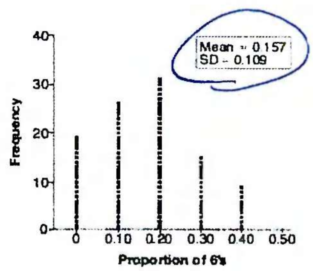
MOE=2(SD)

MOE=2(.066)

MOE= .13

~~71~~ 81. A game spinner is divided into 6 equally sized regions, as shown in the diagram below. For Miles to win, the spinner must land on the number 6. After spinning the spinner 10 times, and losing all 10 times, Miles complained that the spinner is unfair. At home, his dad ran 100 simulations of spinning the spinner 10 times, assuming the probability of winning each spin is $\frac{1}{6}$. The output of the simulation is shown in the diagram below.





Is there strong evidence to suggest that the spinner is unfair? Explain your answer.

CI= .157+2(.109) = .375 (-.061, .375) $\frac{0}{10}=0$

.157-2(.109) = -.061

No, 0 is inside the confidence interval. 0 is in the range of expected values of a fair spinner.

82

~~73~~. Factor the following

Tri

DOTS a) $36-25x^2$

$(6+5x)(6-5x)$

b) $x^2-7x+12$

$(x-4)(x-3)$

c) $\frac{3x^2}{3}+\frac{9x}{3}-\frac{12}{3}$ GCF

$3(x^2+3x-4)$ Tri

$3(x+4)(x-1)$

d) $6x^2-54$ GCF

$6(x^2-9)$ DOTS

$6(x+3)(x-3)$

Tricks Tri

PT

e) $2x^2+7x-4$

x^2+7x-8

$\frac{(x+8)}{2}\frac{(x-1)}{2}$

$(x+4)(2x-1)$

Group

f) $\frac{x^3}{x^2}+\frac{3x^2}{x^2}\frac{-9x}{-9}-\frac{27}{-9}$

$x^2(x+3)-9(x+3)$

DOTS $(x^2-9)(x+3)$

$(x+3)(x-3)(x+3)$

Grouping

g) $\frac{3x^3}{x^2}+\frac{x^2}{x^2}\frac{-12x^2}{-4x}-\frac{4x}{-4x}\frac{-63x}{-21}-\frac{21}{-21}$

$x^2(3x+1)-4x(3x+1)-21(3x+1)$

Tri

$(x^2-4x-21)(3x+1)$

$(x-7)(x+3)(3x+1)$

h) $(x^2-2x)^2-11(x^2-2x)+24$

Sub Tri

$y=x^2-2x$

$y^2-11y+24$

$(y-8)(y-3)$

$(x^2-2x-8)(x^2-2x-3)$

$(x-4)(x+2)(x-3)(x+1)$

Is there a GCF?

2 terms: DOTS or Cubes

3 terms: Trinomial / Tricks Tri

4 or more: Grouping

Can you factor further?

$a=y$ $b=5$ Cubes

i) $\sqrt[3]{y^3}-\sqrt[3]{125}$

$a^3-b^3=(a-b)(a^2+ab+b^2)$

$y^3-125=(y-5)(y^2+5y+25)$

Cubes

$a^3+b^3=(a+b)(a^2-ab+b^2)$

$a^3-b^3=(a-b)(a^2+ab+b^2)$

83

~~74~~. Express the following in simplest form:

Factor

Cancel Common Factors

$\frac{10-5x}{x^2+2x-8}$ GCF

Tri

$\frac{5\cancel{(2-x)}(-1)}{(x+4)\cancel{(x-2)}}$

$\frac{-5}{x+4}$

mr. x!

84

~~75~~. Solve $x^2+5x=2x+40$ algebraically

$-2x-40\quad -2x-40$

$x^2+3x-40=0$

$(x+8)(x-5)=0$

$x+8=0$ $\quad x-5=0$

$-8\ -8$ $\quad +5\ +5$

$x=-8$ $\quad x=5$

Ply Smlt 2nd 1: Poly Root Finder

85
~~76~~. What are the solutions to $4x^2 - 7x - 2 = -10$

1) $-\frac{1}{4}, 2$

2) $\frac{7}{8} \pm \frac{\sqrt{79}}{8} i$

3) $\frac{7}{8} \pm \frac{\sqrt{241}}{8}$

4) $\frac{7}{8} \pm \frac{\sqrt{143}}{8} i$

+10 +10

$4x^2-7x+8=0$

$X = \frac{7}{8} \pm 1.1110243022i$

$\frac{\sqrt{79}}{8} i = 1.1110243022i$

86
~~77~~. Solve the equation $x^2 + 2x = -8$ algebraically and express the answer in simplest $a + bi$ form.

if it doesn't factor, Quadratic formula
Poly Root Finder rarely works if open response

+8 +8

$x^2+2x+8=0$

$X = \frac{-2 \pm \sqrt{(2)^2-4(1)(8)}}{2(1)}$

$X = \frac{-2 \pm \sqrt{-28}}{2}$

$\sqrt{-28}$
$i\sqrt{28}$
$\sqrt{4}\sqrt{7}$
$2i\sqrt{7}$

$X = \frac{-2 \pm 2i\sqrt{7}}{2}$

$X = -1 \pm i\sqrt{7}$

87
~~78~~. Solve $x^3 + 5x^2 = 4x + 20$ algebraically.

$-4x-20 \quad -4x-20$

$(x^3+5x^2-4x-20)=0$

$x^2 \quad x^2 \quad -4 \quad -4$

$x^2(x+5)-4(x+5)=0$

$(x^2-4)(x+5)=0$

$(x+2)(x-2)(x+5)=0$

$x+2=0 \quad x-2=0 \quad x+5=0$

$-2 \; -2 \quad +2 \; +2 \quad -5 \; -5$

$x=-2 \quad x=2 \quad x=-5$

88
~~79~~. Solve the following equation algebraically:
$\sqrt{2x-7} + x = 5$

$-x \quad -x$

	5	$-x$
5	25	$-5x$
$-x$	$-5x$	$+x^2$

$x^2-10x+25$

$(\sqrt{2x-7})^2=(5-x)^2$

$2x-7 = (5-x)(5-x)$

$2x-7 = x^2-10x+25$

$-2x+7 \quad -2x+7$

$0 = x^2-12x+32$

$0=(x-8)(x-4)$

$x-8=0 \quad x-4=0$

$+8 \; +8 \quad +4 \; +4$

~~$x=8$~~ reject

$x=4$

multiply by the LCD

~~80~~ 89. Solve algebraically for x: $x(x+2)\left(\frac{3}{x}\right)+x(x+2)\left(\frac{x}{x+2}\right)=x(x+2)\left(-\frac{2}{x+2}\right)$

$3(x+2)+x^2=-2x$

$3x+6+x^2=-2x$

$+2x \qquad +2x$

$x^2+5x+6=0$

$(x+3)(x+2)=0$

$x+3=0$ | $x+2=0$
$-3 \ -3$ | $-2 \ -2$
$x=-3$ | ~~$x=-2$~~ reject

~~81~~ 90. To solve the equation $(x+7)(x-7)\frac{7}{x+7}+(x+7)(x-7)\frac{4x}{x-7}=(x+7)(x-7)\frac{3x+7}{x-7}$, Joan's first step is to multiply both sides by the least common denominator. Which statement is true?

1) -14 is an extraneous solution.
2) 7 and -7 are extraneous solutions.
3) 7 is an extraneous solution.
4) There are no extraneous solutions.

you could do y1 y2 Intersect here

$7(x-7)+4x(x+7)=(3x+7)(x+7)$

$7x-49+4x^2+28x=3x^2+28x+49$

$-49 \quad -3x^2-28x \quad -3x^2-28x-49$

	$3x$	$+7$
x	$3x^2$	$+7x$
$+7$	$+21x$	$+49$

$x^2+7x-98=0$

$(x+14)(x-7)=0$

$x+14=0$ | $x-7=0$
$-14 \ -14$ | $+7 \ +7$
✓ $x=-14$ | ~~$x=7$~~ rejects extraneous!

~~82~~ 91. Solve the following system of equations algebraically for x and y

$(x+2)^2+(y-4)^2=40$

$y=x+2$

$(x+2)^2+(x+2-4)^2=40$

$(x+2)^2+(x-2)^2=40$

	x	$+2$
x	x^2	$+2x$
$+2$	$+2x$	$+4$

x^2+4x+4

	x	-2
x	x^2	$-2x$
-2	$-2x$	$+4$

x^2-4x+4

$x^2+\cancel{4x}+4+x^2-\cancel{4x}+4=40$

$2x^2+8=40$

$-40 \ -40$

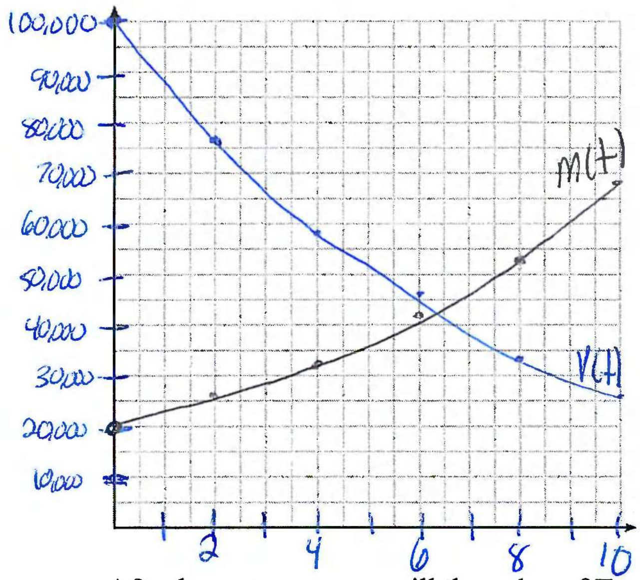
$\frac{2x^2-32=0}{2 \qquad 2}$

$x^2-16=0$

$(x+4)(x-4)=0$

$x+4=0$ | $x-4=0$
$-4 \ -4$ | $+4 \ +4$
$x=-4$ | $x=4$
$y=x+2$ | $y=x+2$
$y=-4+2$ | $y=4+2$
$y=-2$ | $y=6$
$(-4,-2)$ | $(4,6)$

92. The value of Tom's bank account is currently 100000 and is decreasing according to the equation $V(t) = 100000(.876)^t$. The amount of money he has paid for his mortgage can be represented by the equation $M(t) = 20000(1.1304)^t$. Graph and label $V(t)$ and $M(t)$ over the interval [0,10]. no arrows



V(t)

x	y
0	100,000
2	76738
4	58887
6	45188
8	34676
10	26610

M(t)

x	y
0	20,000
2	25556
4	32656
6	41728
8	53320
10	68132

After how many years will the value of Tom's bank account be equal to the amount of money he paid for his mortgage? Round your answer to the *nearest tenth of a year*. Tom will open a new bank account when the value of his account is \$30,000. After how many years, to the *nearest hundredth of a year*, will that happen?

Y1, Y2 intersect

$Y_1 = 100{,}000(.876)^x$

$Y_2 = 20{,}000(1.1304)^x$

intersect

6.3 years

V(t)

$\frac{30{,}000}{100{,}000} = \frac{100{,}000(.876)^t}{100{,}000}$

$.3 = .876^t$

$\frac{\log .3}{\log .876} = \frac{t \log .876}{\log .876}$

$9.09 = t$

or

$Y_1 = 30{,}000$

$Y_2 = 100{,}000(.876)^t$

intersect

$t = 9.09$

93. A Foucault pendulum can be used to demonstrate that the Earth rotates. The time, t, in seconds, that it takes for one swing or period of the pendulum can be modeled by the equation $t = 2\pi\sqrt{\frac{L}{g}}$ where L is the length of the pendulum in meters and g is a constant of 9.81 m/s^2. The first Foucault pendulum was constructed in 1851 and has a pendulum length of 67 m. Determine, to the *nearest tenth of a second*, the time it takes this pendulum to complete one swing. Another Foucault pendulum at the United Nations building takes 9.6 seconds to complete one swing. Determine, to the *nearest tenth of a meter*, the length of this pendulum.

t = time = t

L = Length = 67

$g = 9.81$

$t = 2\pi\sqrt{\frac{67}{9.81}}$

$t = 16.4$

$t = 9.6$

$L = L$

$g = 9.81$

$\frac{9.6}{2\pi} = \frac{2\pi}{2\pi}\sqrt{\frac{L}{9.81}}$

$1.57..^2 = \sqrt{\frac{L}{9.81}}^{\,2}$

$9.81(2.33..) = \left(\frac{L}{9.81}\right)9.81$

$22.9 = L$