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Date _____
Pre Calculus

Unit 1 Review Sheet

Prove the following identities

1. $(x+2)^2 + 2(x+2) - 8 = (x+6)x$

$$\begin{aligned} (x+2)(x+2) + 2(x+2) - 8 &= (x+6)x \\ x^2 + \underline{2x} + \underline{2x} + \underline{4} + \underline{2x} + \underline{4} - 8 &= x^2 + 6x \\ x^2 + 6x &= x^2 + 6x \end{aligned}$$

2. $m^5 + m^3 - 6m = m(m^2 + 3)(m^2 - 2)$

$$\begin{aligned} m^5 + m^3 - 6m &= (m^3 + 3m)(m^2 - 2) \\ m^5 + m^3 - 6m &= m^5 - 2m^3 + 3m^3 - 6m \\ m^5 + m^3 - 6m &= m^5 + m^3 - 6m \end{aligned}$$

3. Solve for m and p : $(x-m)(px+3) = 2x^2 - 9x - 18$

$$\begin{aligned} px^2 + \underline{3x} - \underline{mpx} - \underline{3m} &= 2x^2 - 9x - 18 \\ \underline{px^2} + \underline{(3-mp)x} - \underline{3m} &= \underline{2x^2} - \underline{9x} - \underline{18} \end{aligned}$$

$$\begin{aligned} p &= 2 & 3 - mp &= -9 & 3m &= -18 \\ & & \text{redundant} & & \frac{3m}{3} &= \frac{-18}{3} \\ & & & & m &= -6 \end{aligned}$$

4. Solve for h and k : $3x^3 - 8x^2 + 13 = (3x^2 + hx - 4)(x - 2) + k$

$$\begin{aligned} 3x^3 - 8x^2 + 0x + 13 &= 3x^3 - 6x^2 + hx^2 - 2hx - 4x + 8 + k \\ 3x^3 - 8x^2 + 0x + 13 &= 3x^3 + (h-6)x^2 + (-2h-4)x + 8+k \end{aligned}$$

$$\begin{aligned} -8 &= -6+h & 0 &= -2h-4 & 13 &= 8+k \\ +6 & +6 & +4 & +4 & -8 & -8 \\ -2 &= h & 4 &= -2h & 5 &= k \\ & & \frac{4}{-2} &= \frac{-2h}{-2} & & \\ & & -2 &= h & & \end{aligned}$$

Divide the following polynomials

5. $\frac{2x^3 + 5x^2 - 31x - 84}{x+3}$

$$\begin{array}{r} -3 \overline{) 2 \ 5 \ -31 \ -84} \\ \underline{\downarrow \ -6 \ 3 \ 84} \\ 2 \ -1 \ -28 \ 0 \end{array}$$

$2x^2 - 1x - 28$

6. $\frac{4x^3 + 12x^2 - 5}{x+5}$

$$\begin{array}{r} -5 \overline{) 4 \ 12 \ 0 \ -5} \\ \underline{\downarrow \ -20 \ 40 \ -200} \\ 4 \ -8 \ 40 \ -205 \end{array}$$

$4x^2 - 8x + 40 - \frac{205}{x+5}$

7. $\frac{2x^3 - 3x^2 + 2x + 5}{x-5}$

$$\begin{array}{r} x-5 \overline{) 2x^3 - 3x^2 + 2x + 5} \\ \underline{+ 2x^3 - 10x^2} \\ 7x^2 + 2x \\ \underline{+ 7x^2 - 35x} \\ 37x + 5 \\ \underline{+ 37x - 185} \\ 140 \end{array}$$

$2x^2 + 7x + 37 + \frac{140}{x-5}$

8. $\frac{9x^2 - 2}{3x+1}$

$$\begin{array}{r} 3x+1 \overline{) 9x^2 + 0x - 2} \\ \underline{+ 9x^2 + 3x} \\ -3x - 2 \\ \underline{+ 3x + 1} \\ -1 \end{array}$$

$3x - 1 - \frac{1}{3x+1}$

Factor the following polynomial expressions

9. $\left(\frac{x^3 - 3x^2 + 2x}{x \cdot x \cdot x}\right) \left(\frac{4x^2 - 12x + 8}{4 \cdot 4 \cdot 4}\right)$

$$\begin{aligned} & x(x^2 - 3x + 2) + 4(x^2 - 3x + 2) \\ & (x+4)(x^2 - 3x + 2) \\ & (x+4)(x-2)(x-1) \end{aligned}$$

10. $\left(\frac{3x^3 + x^2}{x^2 \cdot x^2}\right) \left(\frac{12x^2 - 4x - 63x - 21}{-4 \cdot -4 \cdot -21 \cdot -21}\right)$

$$\begin{aligned} & x^2(3x+1) - 4x(3x+1) - 21(3x+1) \\ & (x^2 - 4x - 21)(3x+1) \\ & (x-7)(x+3)(3x+1) \end{aligned}$$

11. $6x^2 + 13x + 5 + 30$

$$\begin{array}{r} (2x^2 + 10x + 3x + 5) \\ \underline{3x \quad 3x} \\ 2x(3x+5) + 1(3x+5) \\ (2x+1)(3x+5) \end{array}$$

12. $9y^2 + 4y + 1 + 3$

$$\begin{array}{r} (3y^2 + 3y + y + 1) \\ \underline{3y \quad 3y} \\ 3y(y+1) + 1(y+1) \\ (3y+1)(y+1) \end{array}$$

Perform the given operation and express your answers in simplest form

13. $\frac{x^2 - 5x + 4}{2x} \div \frac{2x - 2}{8x^2}$

$$\frac{x^2 - 5x + 4}{2x} \cdot \frac{8x^2}{2x - 2}$$

$$\frac{(x-4)(x+1) \cdot 4x^2}{1 \cdot 2x \cdot 2(x-1)}$$

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

$$\frac{9c}{c(c+8)} - \frac{2(c+8)}{c(c+8)} = \frac{9c - 2c - 16}{c(c+8)}$$

$$\frac{7c - 16}{c(c+8)}$$

17. $\frac{1}{3x} + \frac{1}{3x} = \frac{x+1}{3+x}$

14. $\frac{b^2 - b - 6}{2b} \div \frac{b^2 - 4}{b^2}$

$$\frac{b^2 - b - 6}{2b} \cdot \frac{b^2}{b^2 - 4}$$

$$\frac{(b-3)(b+2) \cdot b}{2 \cdot (b-2)(b+2)}$$

16. $\frac{2}{x-4} + \frac{3}{x+4} = \frac{x-4}{x-4}$

$$\frac{2(x+4)}{(x-4)(x+4)} + \frac{3(x-4)}{(x-4)(x+4)}$$

$$\frac{2x+8+3x-12}{(x-4)(x+4)}$$

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

18. $\frac{1}{2x} + \frac{1}{4x} = \frac{x-4}{2+x}$

Solve the following equations for all values:

19. $\frac{1}{x-2} + \frac{4}{x+5} = \frac{x^2 + 3x - 10}{(x+5)(x-2)}$

$$1(x+5) + 4(x-2) = 7$$

$$x+5+4x-8=7$$

$$5x-3=7$$

$$\frac{5x}{5} = \frac{10}{5}$$

$x=2$ reject
No solution

20. $\frac{1}{b-3} + \frac{3}{2b+6} = \frac{b}{(b+3)(b-3)}$

$$2(b+3) - 3(b-3) = 2b$$

$$2b+6 - 3b+9 = 2b$$

$$-b+15 = 2b$$

$$\frac{15}{3} = \frac{3b}{3}$$

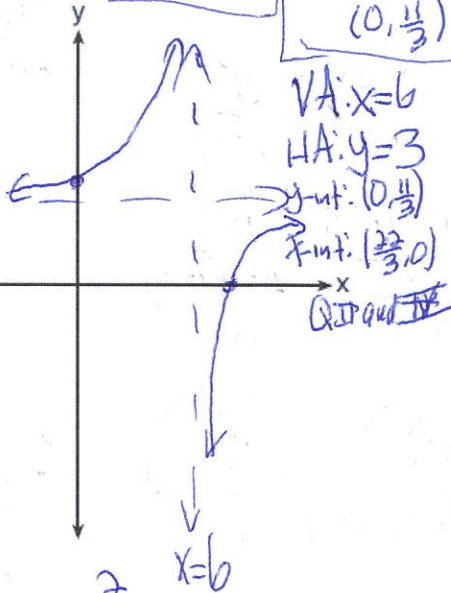
$b=5$

Sketch the following rational functions on the provided grids

21. $y = 3 - \frac{4}{x-6}$

VA: $x-6=0$
 $x=6$

y-int: $y = 3 - \frac{4}{-6}$
 $y = \frac{11}{3}$
 $(0, \frac{11}{3})$

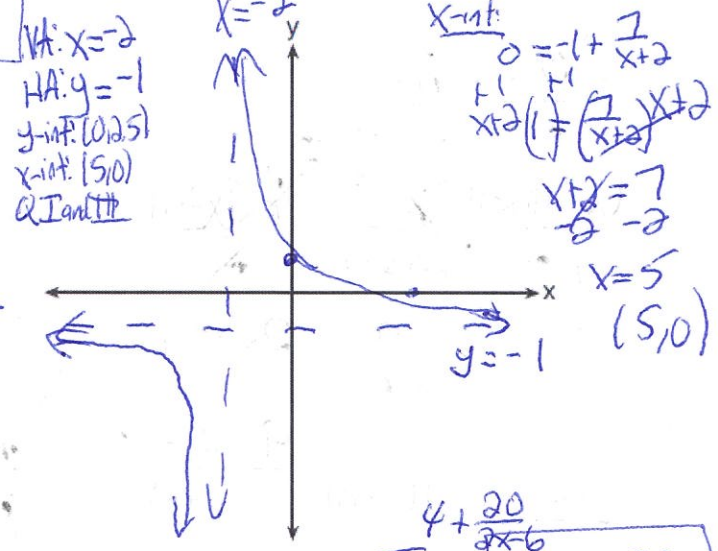


x-int:
 $0 = 3 - \frac{4}{x-6}$
 $-3 = -\frac{4}{x-6}$
 $x-6 = \frac{4}{3}$
 $x = \frac{22}{3}$
 $(\frac{22}{3}, 0)$

22. $y = -1 + \frac{7}{x+2}$

VA: $x+2=0$
 $x=-2$

y-int:
 $y = -1 + \frac{7}{0+2}$
 $y = 2.5$
 $(0, 2.5)$

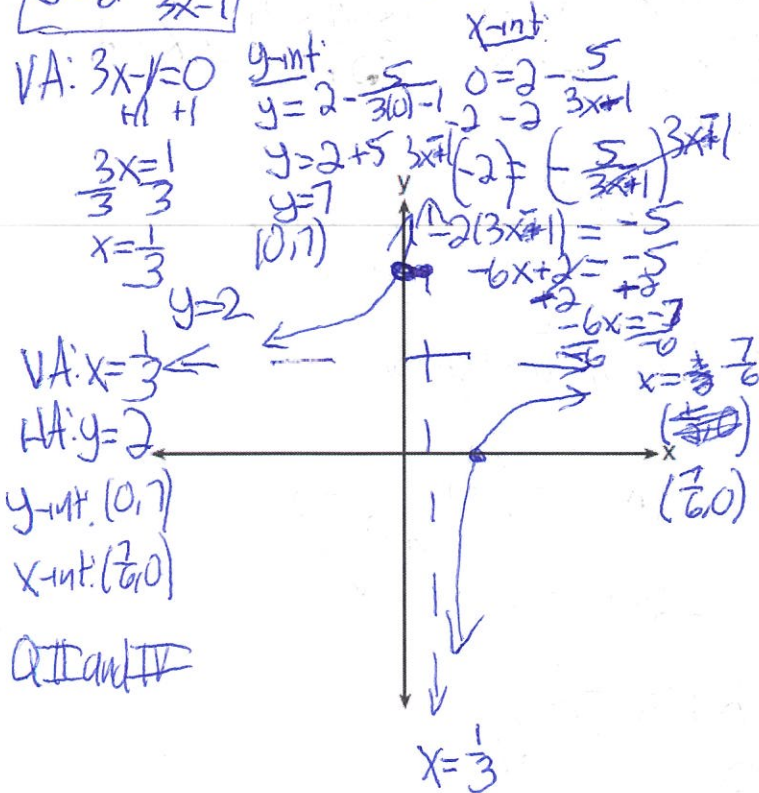


x-int:
 $0 = -1 + \frac{7}{x+2}$
 $1 = \frac{7}{x+2}$
 $x+2 = 7$
 $x = 5$
 $(5, 0)$

23. $y = \frac{6x-7}{3x-1}$

$3x-1 \overline{) 6x-7}$
 $\underline{6x-2}$
 -5

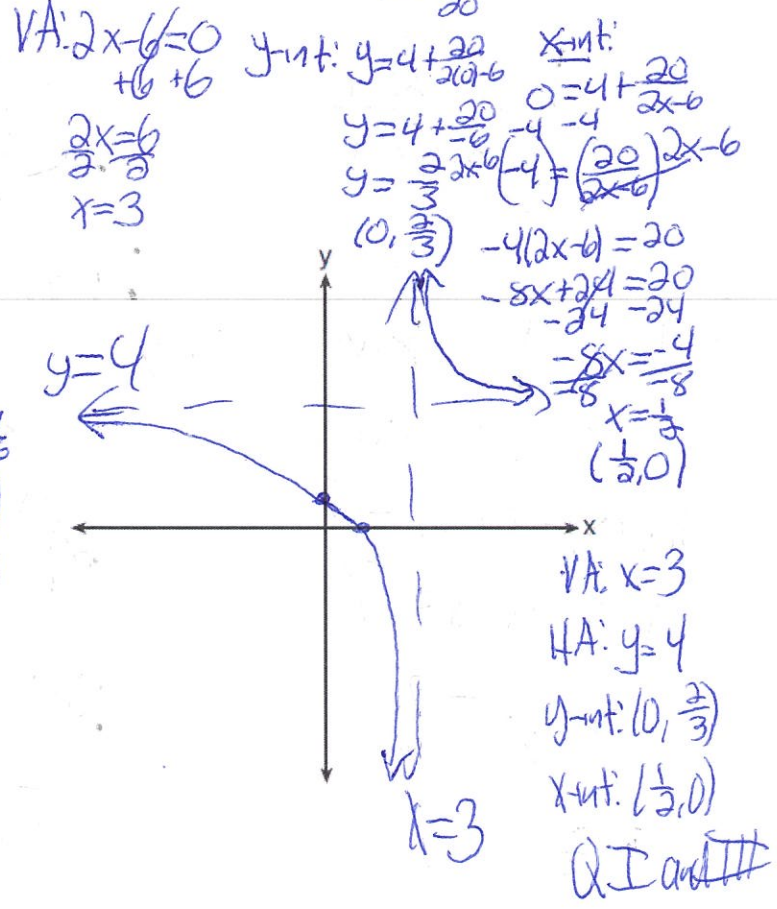
$y = 2 - \frac{5}{3x-1}$



VA: $3x-1=0$
 $x = \frac{1}{3}$
HA: $y=2$
y-int: $(0, 7)$
x-int: $(\frac{7}{6}, 0)$
Q.I and III

24. $y = \frac{8x-4}{2x-6}$

$2x-6 \overline{) 8x-4}$
 $\underline{4x-12}$
 $4x+24$
 20
 $y = 4 + \frac{20}{2x-6}$



VA: $2x-6=0$
 $x=3$
y-int: $y = 4 + \frac{20}{2(0)-6}$
 $y = 4 - \frac{20}{6} = \frac{4}{3}$
x-int: $0 = 4 + \frac{20}{2x-6}$
 $-4 = \frac{20}{2x-6}$
 $-4(2x-6) = 20$
 $-8x+24 = 20$
 $-8x = -4$
 $x = \frac{1}{2}$
 $(\frac{1}{2}, 0)$
VA: $x=3$
HA: $y=4$
y-int: $(0, \frac{4}{3})$
x-int: $(\frac{1}{2}, 0)$
Q.I and III