Name _____ Date _____

Algebra II CC – Midterm Review #1 Period _____

UNIT 1: FACTORING AND SOLVING POLYNOMIAL EQUATIONS

1. If $p(x) = (5x^2 + 2x - 1)(x^2 - x - 4)$ and $q(x) = 7x^4 - x^3 + 5x - 9$, find $p(x) - q(x)$ in simplest form.

2. Prove that $(2x)^2 + (x^2 - 1)^2 = (x^2 + 1)^2$ is an identity for all real numbers, x.

3. Emily thinks that $2x + 1$ is a factor of $2x^3 - 13x^2 - x + 3$. Is Emily correct? Explain your answer.

4. Factor each expression completely:

a $4x^2 - 20x - 96$	*b* $a^4 + 4a^2 - 32$	*c* $9x^3 + 45x^2 - 4x - 20$
d $125c^3 - 64$	*e* $2x^2 - 11x + 14$	
f $x^3 + 3x^2 - 18x - 2x^2 + 6x - 36$		Remember Types of Factoring: GCF DOTS Trinomials Grouping ***Always factor completely!!**

5. It is known that $x - 5$ is a factor of $p(x) = x^4 - 12x^3 + 35x^2 - 9x^2 + 108x - 315$. Determine and state the zeroes of the equation $p(x) = 0$.

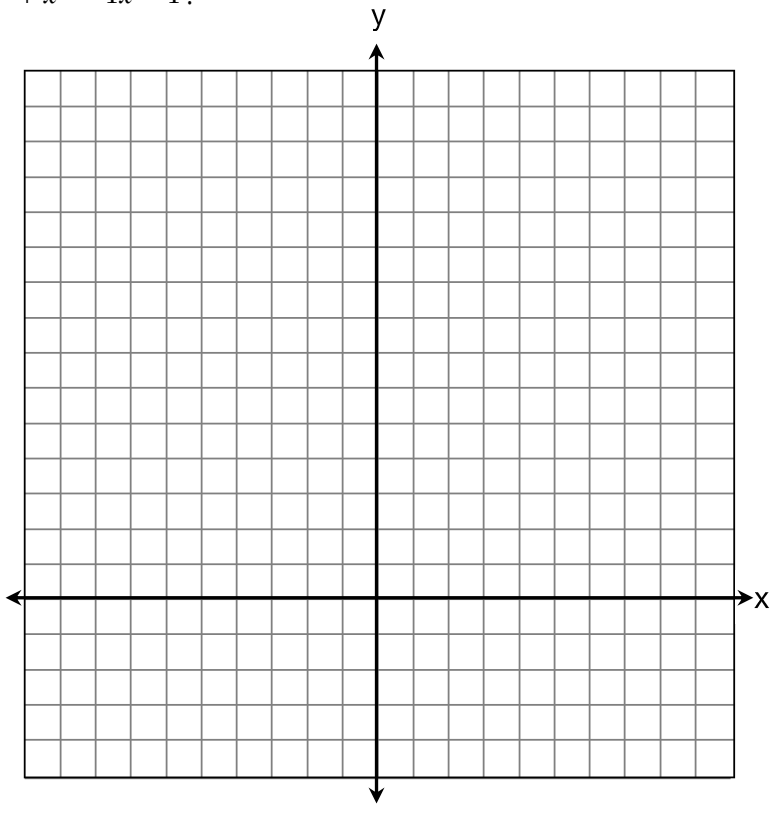
6. Find the zeroes of each equation:

a $x^4 - 25x^2 + 144 = 0$	*b* $4x^2 = 15 - 4x$
c $6x^3 - 5x^2 - 4x + 36x^2 - 30x - 24 = 0$	*d* $(2x^2 + 3x)^2 - 4(2x^2 + 3x) - 5 = 0$

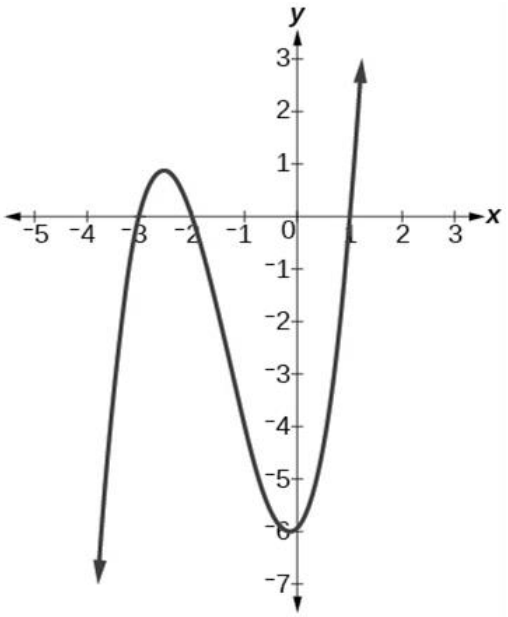
UNIT 2: POLYNOMIAL GRAPHS & THE REMAINDER THEOREM

7. Determine algebraically the zeroes of $q(x) = x^3 + x^2 - 4x - 4$.

Graph $q(x)$ on the set of axes below.



8. The graph to the right shows $y = p(x)$.



State the zeroes of $p(x)$.

State the factors of $p(x)$.

What is the degree of $p(x)$?

How many relative maxima does $p(x)$ have?

How many relative minima does $p(x)$ have?

Describe the end-behavior of $p(x)$ using proper notation.

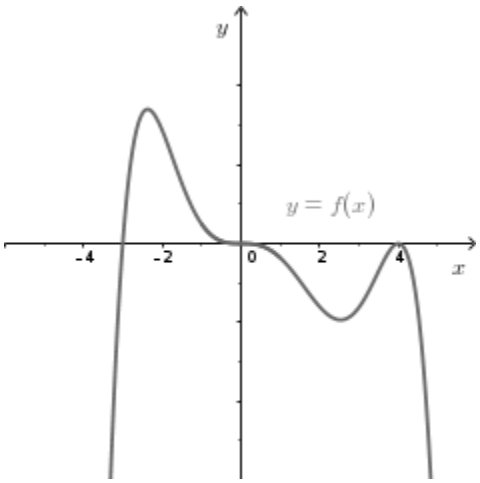
State the interval(s) over which $p(x)$ is increasing using a proper notation.

State the interval(s) over which $p(x)$ is decreasing using a proper notation.

Would the remainder when $p(x)$ is divided by $x-1$ be positive, negative, or zero?

Would the remainder when $p(x)$ is divided by $x+1$ be positive, negative, or zero?

9. The diagram to the right is the graph of the polynomial $y = f(x)$.



State the least degree that $f(x)$ could be. Justify your answer.

Write a possible equation for $f(x)$.

10. State the Remainder Theorem for a polynomial $p(x)$.

Explain how the Remainder Theorem can be used to determine factors (and then zeroes) of a polynomial.

11. If the polynomial $b(x) = x^4 + 2x^3 + kx^2 - 2x + 8,$ determine the value of k such that $x - 2$ is a factor of $b(x)$.

Determine all the zeroes of $b(x)$.

12. Find the quotient: $\dfrac{3x^4 - 8x^3 + 2x + 7}{x - 2}$

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Algebra II CC – Midterm Review HW #1 Period _____

1. For which function does $f(x) \to -\infty$ as $x \to \infty$ and $f(x) \to \infty$ as $x \to -\infty$?

(1) $f(x) = x^3 - 4x^2 + x$

(2) $f(x) = -4x^3 + 7x^2 - x + 1$

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

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

2. The zeroes of the function $x^4 - 13x^2 + 36 = 0$ are

(1) $\{2, 3\}$

(2) $\{-2, -3\}$

(3) $\{\pm 2, \pm 3\}$

(4) $\{\pm 2i, \pm 3i\}$

3. The expression $\frac{x^2 + 5x - 20}{x - 3}$ is equivalent to

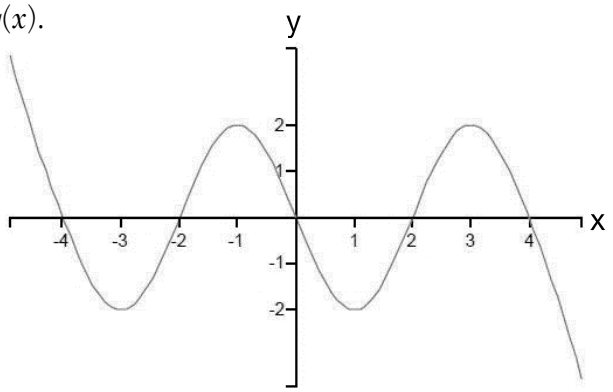
(1) $x + 8 + \frac{4}{x-3}$

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

(3) $x + 8$

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

4. The graph to the right shows a polynomial function $y = q(x)$.



Which statement is true?

(1) The leading coefficient of q is positive.

(2) The remainder when $q(x) \div (x - 3)$ is negative.

(3) The graph of q is decreasing for $-1 < x < 1$.

(4) q is a fourth-degree polynomial.

5. For a polynomial function $g(x)$, it is known that $g(-4) = 0$. Which statement is true?

(1) The remainder when g is divided by $x - 4$ is zero.

(2) The binomial $x - 4$ is a factor of g.

(3) A zero of the graph of g is -4.

(4) The graph of g has an x-intercept at $x = 4$.

6. Which factorization is *incorrect*?

(1) $3w^2 - 19w + 6 = (3w - 1)(w - 6)$

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

(3) $c^2 - 12c + 36 = (c + 6)(c - 6)$

(4) $81 - 121y^2 = (9 - 7y)(9 + 7y)$

7. Determine the value of k for the polynomial $p(x) = 2x^3 + 3x^2 + kx - 30$ if p has a factor of $x + 2$.

Determine all of the zeroes of $p(x)$.

8. Prove that $(a + b^2)^2 - (a - b^2)^2 = 4ab^2$ for all real numbers a and b.

9. Factor completely: $x^3 - 8x^2 + 15x - 2x^2 + 16x - 30$