Honors Algebra 2 **Name: _____**
The Polynomial Review **Date: _____ Period: ____**

1.) **What is the remainder when $p(x) = x^6 - 2x^3 + x - 1$ is divided by $(x + 1)$?**

a.) -3
b.) -1
c.) 1
d.) 3

2.) **If $p(x) = x^3 - 2x^2 + 9x - 2$, which of the following statement(s) is/are true?**

i. $x - 3$ **is a factor of** $p(x)$
ii. $x = 3$ **is a root of** $p(x)$
iii. $p(3) = 34$
iv. $p(-3) = 34$

a.) **i only**
b.) **iii only**
c.) **i and ii only**
d.) **i and iii only**
e.) **i and iv only**

3.) **How many real roots must the following equation have?**

$$x^4(x^2 - 4) + 9(x^2 - 4) = 0$$

a.) **1**
b.) **2**
c.) **4**
d.) **none**

4.) **Determine the quotient when $x^3 - 2x^2 - 9$ is divided by $(x - 3)$?**

a.) $x^2 + 5x + 15$
b.) $x^2 + x - 6$
c.) $x^2 - 5x + 6$
d.) $x^2 + x + 3$

5.) **What are the zeros of the polynomial function $f(x) = 2x^3 - 8x^2 + 6x$?**

a.) $x = 0, 1, 3$
b.) $x = 1, 2, 3$
c.) $x = 0, -1, -3$
d.) $x = 0, 1, -4$

6.) If $(x+2)$ is a root of $3x^3+kx^2-31x-54$. What is the value of k?

a.) -8
b.) -4
c.) -51
d.) 4

7.) Find the remainder when $f(x)=x^6+5x^5-x^3+x-6$ is divided by $(x+1)$.

a.) 0
b.) -10
c.) -1
d.) -12

8.) Given that a function $f(x)$ has a zero at $x=3$ with multiplicity 2, then we know that…

a.) the graph of $f(x)$ crosses the y – axis at 3.
b.) $as\ x \to \infty, f(x) \to \infty$
c.) the graph of $f(x)$ crosses the x – axis at 3.
d.) the graph of $f(x)$ touches but does not cross the x – axis at 3.

9.) The polynomials $p(x)=x^4+5x^3-2x^2-24x$ has a zero at $x=2$. Factor p completely.

a.) $p(x)=x(x+2)(x+3)(x+4)$
b.) $p(x)=(x-2)(x-3)(x-4)$
c.) $p(x)=x(x+2)(x-3)(x-4)$
d.) $p(x)=x(x-2)(x+3)(x+4)$

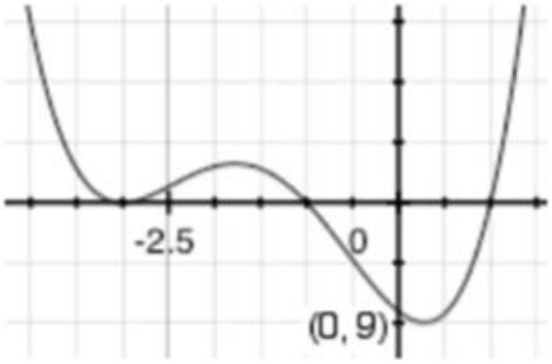
10.) For the given polynomials function, $f(x)=-5x^2(x-8)(x+2)^3$, find the zeros of the function and state the multiplicity of each.

a.) $-2, multiplicity\ 1;\ 2, multiplicity\ 1;\ 8, multiplicity\ 1$
b.) $-2, multiplicity\ 3;\ 0, multiplicity\ 2;\ 8, multiplicity\ 1;\ 2, multiplicity\ 1$
c.) $-2, multiplicity\ 1;\ 0, multiplicity\ 2;\ 8, multiplicity\ 1$
d.) $-2, multiplicity\ 3;\ 0, multiplicity\ 2;\ 8, multiplicity\ 1$

11.) For the given polynomials function, $f(x)=x^3+6x^2-x-6$, find the zeros of the function and state the multiplicity of each.

a.) $-1, multiplicity\ 1;\ 1, multiplicity\ 1;\ 6, multiplicity\ 1$
b.) $-6, multiplicity\ 2;\ 1, multiplicity\ 1$
c.) $-6, multiplicity\ 1;\ -1, multiplicity\ 1;\ 1, multiplicity\ 1$
d.) $-6, multiplicity\ 3;\ -1, multiplicity\ 1;\ 1, multiplicity\ 1$

12.) **The equation that would best model the following graph is:**



a.) $f(x) = (x+3)^2(x^2-1)$
b.) $f(x) = (x+3)(x-1)(x+1)$
c.) $f(x) = x^4 + 6x^3 + 9x^2 - 6x - 9$
d.) $f(x) = -(x+3)^2(x^2-1)$

13.) **The function $f(x)$ has a zero of 2 with a multiplicity 3. We know…**

a.) **Since 3 is an odd number, the graph touches but does not cross the x – axis.**
b.) **Since 3 is an odd number, the graph crosses the x – axis.**
c.) **Since 2 is an even number, the graph touches but does not cross the x – axis.**
d.) **Since 2 is an even number, the graph crosses the x – axis.**

14.) **The function $f(x)$ has a zero of 3 with a multiplicity 2. We know…**

a.) **Since the zero is 3, the graph crosses the y – axis at 3.**
b.) **Since the zeros is 3, the graph goes up to the right.**
c.) **Since the multiplicity is 2, the graph crosses the x – axis.**
d.) **Since the multiplicity is 2, the graph touches but does not cross the x – axis.**

15.) **Using a graphing calculator, find the relative minimum, relative maximum, and zeros of $f(x) = 3x^3 + 15x^2 - 12x - 60$. If necessary, round to the nearest hundredth.**

a.) $\boldsymbol{relative\ minimum}: (-62.24, 0.36), \boldsymbol{relative\ maximum}: (37.79, -3.69), \boldsymbol{zeros}: x = 5, -2, 2$
b.) $\boldsymbol{relative\ minimum}: (0.36, -62.24), \boldsymbol{relative\ maximum}: (-3.70, 37.79), \boldsymbol{zeros}: x = -5, -2, 2$
c.) $\boldsymbol{relative\ minimum}: (0.36, -62.24), \boldsymbol{relative\ maximum}: (-3.70, 37.79), \boldsymbol{zeros}: x = 5, -2$
d.) $\boldsymbol{relative\ minimum}: (-62.24, 0.36), \boldsymbol{relative\ maximum}: (37.79, -3.69), \boldsymbol{zeros}: x = -5, -2$

16.) **Using the polynomial, f$(x) = -2x^3 + 4x - 8$, explain how the degree and leading coefficient will affect the end behavior.**

a.) **Because the degree is odd, the ends will point in opposite direction, and because the leading coefficient is negative the graph will point down on the right.**

b.) **Because the degree is odd, the ends will point in opposite direction, and because the leading coefficient is negative the graph will point up on the right.**

c.) **Because the degree is odd, the ends will point in the same direction, and because the leading coefficient is negative the graph will point down on the right.**

d.) **Because the degree is odd, the ends will point in the same direction, and because the leading coefficient is negative the graph will point up on the right.**

17.) **Divide** $x^2+4\overline{)x^4+6x^3-8x^2+5x-8}$

18.) **Find ALL zeros of the given function.**

a.) $f(x)=x^3+4x^2+14x+20$

Number of Positive Real Zeros	Number of Negative Real Zeros	Number of Imaginary Zeros

Total # of Zeros: _____

Zeros: _____

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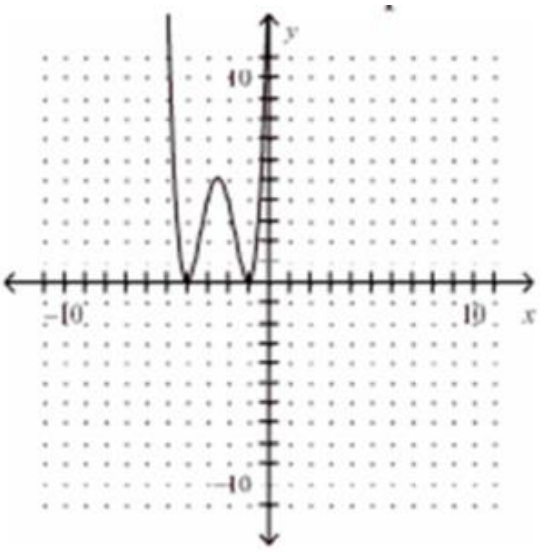
b.) $f(x)=x^4-6x^3+25x^2-96x+144$

Number of Positive Real Zeros	Number of Negative Real Zeros	Number of Imaginary Zeros

Total # of Zeros: _____

Zeros: _____

19.) **A complete graph of a polynomial function g is shown at the right.**



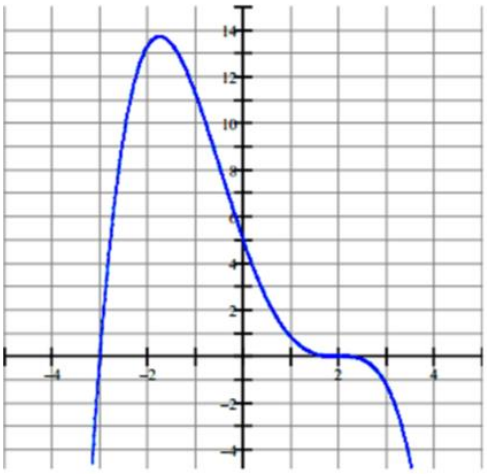
a.) **Is the degree of $g(x)$ even or odd? _____.**
Explain: _____
_____
_____

b.) **Is the leading coefficient of $g(x)$ positive or negative? _____.**
Explain: _____
_____
_____

c.) **What do the real zeros of $g(x)$ appear to be? _____**

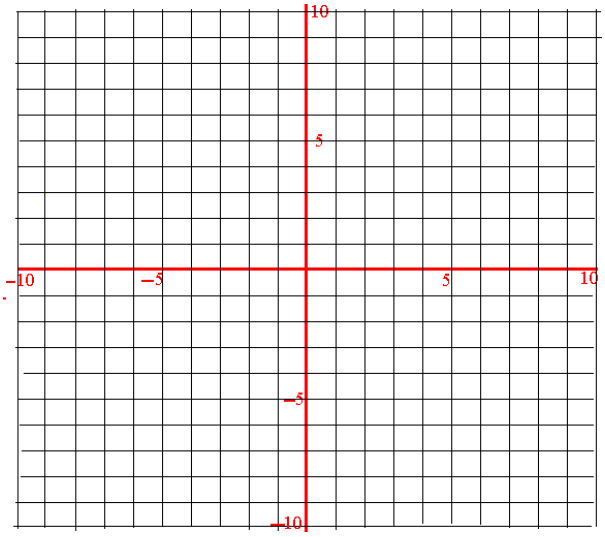
d.) **What is the smallest possible degree of $g(x)$? _____. Explain: _____**
_____
_____

20.) **Write the polynomial function of lowest degree in factored form for the following graph.**



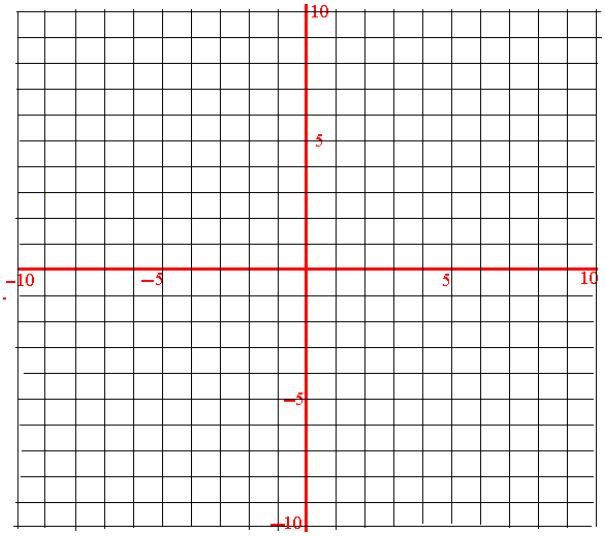
21.) **Using what you know about zeros, multiplicity, and end behavior draw a sketch of the graph of the following function:**

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



22.) **Find all roots for $f(x) = x^3 + x^2 - 4x + 6$ given $(x + 3)$ is a factor of the polynomial.**

23.) **Sketch $f(x) = x^3 + 6x^2 - x - 6$.**



Degree: _____

Lead Coefficient: _____

End Behavior: $as\ x \to \infty, f(x) \to$ _____

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

Zero(s): _____

Relative Max: _____

Relative Min: _____

Intervals Increasing: _____

Intervals Decreasing: _____

24.) **Given $f(x) = x^7 + 4x^6 - 2x^5 + x^4 - 2x^3 - 2x^2 - 3x + 5$ complete the table below with the possible combinations of positive real zeros, negative real zeros, and complex zeros.**

Positive Real Zeros	Negative Real Zeros	Complex Zeros	Total Zeros

25.) **A florist delivers flowers to anywhere in town. d is the distance from the delivery address to the florist shop in miles. The cost to deliver flowers, based on the distance d, is given by $(d) = 0.04d^3 - 0.65d^2 + 3.5d + 9$. Evaluate $C(d)$ for $d = 6$ and $= 11$, and describe what the values of the function represent.**

$C(6) =$ _____.

$C(11) =$ _____.

26.) **A jewelry box has a length that is 2 inches longer than the width and a height that is 1 inch smaller than the width. The volume of the box is 140 cubic inches. What is the width of the jewelry box? (Hint: $V = lwh$)**

Length: _____
Width: _____
Height: _____

27.) **The profit P (in millions of dollars) for a T-shirt manufacturer can be modeled by $P(x) = -x^3 + 4x^2 + x$ where x is the number of T-shirts produced (in millions). Currently, the company produced 4 million T-shirts and makes a profit of $\$4,000,000$. What lesser number of T-shirts could the company produce and still make the same profit?**

28.) **During soccer practice, Jill decided to see how high she can kick a soccer ball straight-up in the air. Her teammate, Jordan, who loves math, calculated that the height, in feet, of the soccer ball can be modeled by the equation $h(t) = -3t^2 + 24t + 3$, for t seconds.**

a.) **What was the initial height of the soccer ball when Jill's foot struck the ball?_____**

b.) **When will the soccer ball reach its maximum height? _____**

c.) **What will be the maximum height of the soccer ball? _____**

d.) **When will the soccer ball hit the ground? _____**

e.) **When would the soccer ball reach a height of 30 feet? _____**