Date ______________ Block ________ Review

Pre-Calculus Review 2.1-2.3 Show all work!

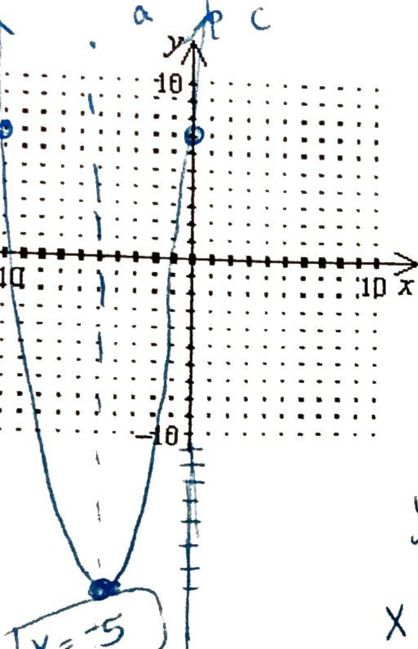
Formulas you may need for this test:

$y = a(x-h)^2 + k$ $\quad$ $y = ax^2 + bx + c$ $\quad$ vertex (h,k) $\quad$ $h = \frac{-b}{2a}$ $\quad$ $k = f(\frac{-b}{2a})$ $\quad$ $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

Find the vertex form of the equation, find the vertex, equation of axis of symmetry, and x& y -intercepts. Does it have a max or min and if so which and give the order pair. Graph

a) $f(x) = x^2 + 10x + 7$

a b c



$h = \frac{-b}{2a}$

$K = f(-\frac{b}{2a})$

$h = \frac{-10}{2(1)} = -5$

$K = (-5)^2 + 10(-5) + 7$

$K = -18$

$y = 1(x+5)^2 - 18$

Vertex $\boxed{(-5,-18)}$

y int.

$y = (0)^2 + 10(0) + 7 = 7$

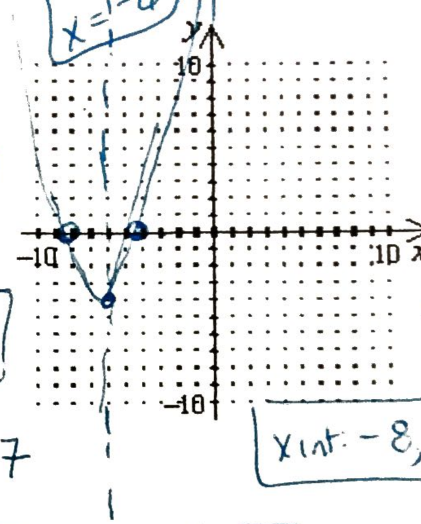
$\boxed{(0,7)}$

$X = \frac{-10 \pm \sqrt{(10)^2 - 4(1)(7)}}{2(1)} = \frac{-10 \pm \sqrt{72}}{2} = \frac{-10 \pm 6\sqrt{2}}{2} = \boxed{-5 \pm 3\sqrt{2}}$ x intercepts

$\boxed{X = -5}$

b) $f(x) = x^2 + 12x + 32$

$\boxed{x = -6}$



$h = \frac{-12}{2(1)} = \frac{-12}{2} = -6$

$K = (-6)^2 + 12(-6) + 32 = -4$

vertex $\boxed{(-6,-4)}$

y int

$y = (0)^2 + 12(0) + 32 = 32$

$\boxed{(0,32)}$

$X = \frac{-12 \pm \sqrt{(12)^2 - 4(1)(32)}}{2(1)}$

$X = \frac{-12 \pm \sqrt{144 - 128}}{2}$

$\frac{-12 \pm \sqrt{16}}{2}$

$\boxed{\text{X int: } -8, -4}$

Write the vertex form of the quadratic function if the parabola goes through the point (7,15) with a vertex at (5, 12)

x y $\quad$ h k

Remember to use: $Y = a(x-h)^2 + k$

$15 = a(7-5)^2 + 12$

$15 = a(2)^2 + 12$

$15 = 4a + 12$

$3 = 4a$

$a = \frac{3}{4}$

$\boxed{f(x) = \frac{3}{4}(x-5)^2 + 12}$

Write the simplest (degree 3) polynomial functions with zeros -3, 5, 1

roots

$x = -3 \Rightarrow (x+3)$ is factor

$x = 5 \Rightarrow (x-5)$

$x = 1 \Rightarrow (x-1)$

$(x+3)(x-5)(x-1)$

$(x^2 - 2x - 15)(x-1)$

$f(x) = x^3 - x^2 - 2x^2 + 2x - 15x + 15 = \boxed{x^3 - 3x^2 - 13x + 15 = f(x)}$

Find the real zeros of the quadratic function using the quadratic formula. **SHOW WORK**

a) $x^2 - 4x - 8 = 0$

a b c

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

$X = \frac{4 \pm \sqrt{16 + 32}}{2} = \frac{4 \pm \sqrt{48}}{2}$

$\frac{4 \pm 4\sqrt{3}}{2}$

$\boxed{2 \pm 2\sqrt{3}}$

b) $-3x^2 - 6x - 9 = -13$

+13 +13

$-3x^2 - 6x + 4 = 0$

a b c

$X = \frac{6 \pm \sqrt{(-6)^2 - 4(-3)(4)}}{2(-3)}$

$\frac{6 \pm \sqrt{84}}{-6}$

5. Find all the zeros of the polynomial and determine the multiplicity of each zero $f(x) = x^4 - 25x^2$

$0 = x^2(x^2 - 25)$

$x^2 = 0$ $\quad (x-5)(x+5)$

$\boxed{x = 0\ (x2)}$ $\quad (x-5) = 0$ $\quad (x+5) = 0$

$\boxed{x = 5\ (x1)}$ $\quad \boxed{x = -5\ (x1)}$

~~6. Describe the number of zeros, number of turns, and end behavior of the polynomial? f(x)~~ $-7x^2 - 5x^4$

↑ even

negative

4 zeros

3 turns

opens down to left & down to right

7. The value of Jennifer's stock portfolio is given by the function $v(t) = 50 + 73t - 3t^2$, where v is the value of the portfolio in hundreds of dollars and t is the time in months. How much money did Jennifer start with? When will the value of Jennifer's portfolio be at a maximum?

maximum

$k = -3\left(\frac{73}{6}\right)^2 + 73\left(\frac{73}{6}\right) + 50 =$ $\$494$

$v(t) = \underset{a}{-3t^2} + \underset{b}{73t} + \underset{c}{50}$

Jennifer started with $\$5000.00$

$h = \frac{-b}{2a} = \frac{-73}{2(-3)} = \frac{-73}{-6}$ ≈ 12.2 months

$(12.2, 494)$

Divide the following problem using long division and synthetic.

8. $\frac{x^4+2x^3-13x^2-28x+24}{x+3}$

$$\begin{array}{r|rrrrr} -3 & 1 & 2 & -13 & -28 & 24 \\ & \downarrow & -3 & 3 & 30 & -6 \\ \hline & 1 & -1 & -10 & 2 & \boxed{18} \end{array}$$

$x^3 - x^2 - 10x + 2 + \frac{18}{x+3}$

$$\begin{array}{r} x^3 - x^2 - 10x + 2 \\ x+3 \,\big)\, \cancel{x^4} + 2x^3 - 13x^2 - 28x + 24 \\ -(\cancel{x^4} + 3x^3) \\ -\cancel{x^3} - 13x^2 \\ -(-\cancel{x^3} - 3x^2) \\ -10\cancel{x^2} - 28x \\ -(-10x^2 - 30x) \\ 2x + 24 \\ -(2x + 6) \\ 18 \end{array}$$

same

Divide using long division

9. $\frac{x^4+5x^3-20x-16}{x^2-x-3}$

$$\begin{array}{r} x^2 + 6x + 9 + \frac{7x+11}{x^2-x-3} \\ x^2 - x - 3 \,\big)\, \cancel{x^4} + 5x^3 + 0x^2 - 20x - 16 \\ -(\cancel{x^4} - x^3 - 3x^2) \\ 6x^3 + 3x^2 - 20x \\ -(6x^3 - 6x^2 - 18x) \\ 9\cancel{x^2} - 2x - 16 \\ -(9x^2 - 9x - 27) \\ 7x + 11 \end{array}$$

10. Is (x+2) a factor of $2x^4 - 5x^2 + 5x - 2$?(use long or synthetic division)

↑ $0x^3$

$$\begin{array}{r|rrrrr} -2 & 2 & 0 & -5 & 5 & -2 \\ & \downarrow & -4 & 8 & -6 & 2 \\ \hline & 2 & -4 & 3 & -1 & \boxed{0} \end{array}$$

yes!!! no remainder

11. Use synthetic division to evaluate f(2) given that $f(x) = 3x^3 - 19x^2 + 2x + 24$

2	3	-19	2	24
	↓	6	-26	-48
	3	-13	-24	-24

Old way is to Plug in

✓ $3(2)^3 - 19(2)^2 + 2(2) + 24$

$3 \cdot 8 - 19 \cdot 4 + 4 + 24$

$24 - 76 + 4 + 24$

$-52 + 4 + 24$

$-48 + 24$

-24

12. Explain the end behavior or draw a sketch of each case below.

a. Degree is even, leading coefficient is negative — down left & down right

b. Degree is odd, , leading coefficient is negative — up left, down right

c. Degree is even, leading coefficient is positive — up left, up right

d. Degree is odd, leading coefficient is positive — down left, up right

FOR 13 -17 use the polynomial below:

$y = x^5 - 5x^3 + 4x$

13. Use the leading coefficient test to determine the **end behavior** of the graph of the polynomial on the left__down__ & right__up__

14. The # of possible zeros__5__

15. The # of possible turns__4__

$y = x^5 - 5x^3 + 4x$

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

16. Find the actual zeros(roots)by factoring________.

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

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

$x = 0 \quad x = -2 \quad x = 2 \quad x = -1 \quad x = 1$

17. Use the roots and the multiplicity of each to draw a sketch of the graph.