Week 5 Math 1508 Worksheet – Review of first 5 weeks

1. Find the x- and y-intercepts for the following functions
   a. $y = |4x - 12|$

   $(3,0)$

   b. $y = 2x^3 - 8x$

   $(-2,0), (0,0), and\ (2,0)$

2. Find the equation of the line passing though the given points.
   a. $(-3,-3)\ ;\ (4,-3)$

   $y = -3$

   b. $\left(1,\frac{3}{4}\right)\ ;\ \left(-\frac{3}{4},\frac{1}{2}\right)$

   $y = \frac{1}{7}x + \frac{17}{28}$

3. Write the equation of the lines through the given point (a) parallel to and (b) perpendicular to the given line.
   a. $4x - 2y = 3, \quad (5,-2)$

   $parallel: y = 2x - 12, \qquad perpendicular: y = -\frac{1}{2}x + \frac{1}{2}$

   b. $5x + 3y = 3, \quad \left(\frac{3}{4},-\frac{2}{5}\right)$

   $parallel: y = -\frac{5}{3}x + \frac{17}{20}, \qquad perpendicular: y = \frac{3}{5}x - \frac{17}{20}$

4. Evaluate the function at each specified value of the independent variable and simplify.
   a. $f(x) = \begin{cases} 4 - 8x & x \le -3 \\ 5 & -3 < x < 2 \\ 5 - x^5 & x \ge 2 \end{cases}$
      i. $f(-3)$

      $f(-3) = 28$

      ii. $f(0)$

      $f(-3) = 5$

iii. $f\left(\frac{5}{2}\right)$

$$f\left(\frac{5}{2}\right) = -\frac{2965}{32}$$

b. $f(x) = -x^2 - 6x + 4$

i. $f(-2)$

$$f(-2) = 12$$

ii. $f\left(\frac{2}{3}\right)$

$$f\left(\frac{2}{3}\right) = -\frac{4}{9}$$

5. Find the inverse for the given functions, then state the domains and ranges for f and f^{-1}.

a. $f(x) = \frac{9+2x}{5x-2}$

$$f^{-1}(x) = \frac{-2x-9}{2-5x}$$

	Domain	Range
$f(x)$	$\left(-\infty, \frac{2}{5}\right) \cup \left(\frac{2}{5}, \infty\right)$	$\left(-\infty, \frac{2}{5}\right) \cup \left(\frac{2}{5}, \infty\right)$
$f^{-1}(x)$	$\left(-\infty, \frac{2}{5}\right) \cup \left(\frac{2}{5}, \infty\right)$	$\left(-\infty, \frac{2}{5}\right) \cup \left(\frac{2}{5}, \infty\right)$

b. $f(x) = \sqrt{x^2 + 6}, \quad x \geq 0$

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

	Domain	Range
$f(x)$	$(-\infty, \infty)$	$[\sqrt{6}, \infty)$
$f^{-1}(x)$	$[\sqrt{6}, \infty)$	$(-\infty, \infty)$

Identify the vertex, axis of symmetry, and x- and y-intercepts for the following function.

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

$$Axis\ of\ symmetry:\ x = -3$$

$$Vertex\colon\ (-3,-16)$$
$$y-intercept\colon\ (0,2),$$
$$x-intercept\colon\ \left(-3-2\sqrt{2},0\right)\ and\ \left(\left(-3+2\sqrt{2},0\right)\right)$$

6. Explain in your own words how the Intermediate Value Theorem helps you find real zeros of a polynomial function.

"The Intermediate Value Theorem helps you locate the real zeros of a polynomial function in the following way. If you can find a value x=a at which a polynomial function is positive, and another value x=b at which it is negative, then you can conclude that the function has at least one real zero between thee tow values" (Larson, 2014, p. 131).

[Answers may vary]

7. Find the real zeros for the following polynomial functions
   a. $f(x)=3x^3-19x^2+33x-9$

$$(3,0),(3,0)[double\ root],and\ \left(\frac{1}{3},0\right)$$

   b. $f(x)=3x^4-8x^3-37x^2+2x+40$

$$(-2,0),\left(-\frac{4}{3},0\right),(1,0)and\ (5,0)$$

8. Write the polynomial as the product of linear factors and list all the zeros of the function.

$$f(x)=x^3+8x+11x-20$$

$$(x+5)(x-1)(x+4)$$

9. Use the given zero to find all the zeros of the function
   a. $f(x)=x^4+3x^3-5x^2-21x+22 \qquad -3+\sqrt{2}\,i$

$$x=-3+\sqrt{2}\,i, x=-3-\sqrt{2}\,i, x=1, x=2$$

b. $f(x) = x^3 + 4x^2 + 14x + 20$ $\quad -1 - 3\,i$

$x = -1 - 3i, x = -1 + 3i, x = -2$