Math 150 Week in Review 3 Problem Set

1. Find the equation of the line that
   (a) passes through the $y$-intercept of the line $-2x + 3y = 9$ and is parallel to the line $7x - 4y = 6$.
   (b) passes through the $x$-intercept of the line $3x - 8y = 12$ and is perpendicular to the line $x = 3$.

2. Suppose that the relationship between the cost of utilities and the average temperature in a month is linear. If the average temperature in a month is $96^\circ$, your utilities bill is $100. If the average temperature in a month is $81^\circ$, your utilities bill is $75.
   (a) Find an equation that expresses the cost of your utilities, $C$, in terms of the average temperature, $T$, in any given month.
   (b) How much will your utilities bill increase if the average temperature in the current month is $6^\circ$ higher than the average temperature last month?

3. Find an equation of the perpendicular bisector of the line segment joining the points $(-1, 2)$ and $(4, 3)$.

4. Determine whether the following equations define $y$ as a function of $x$.
   (a) $x^2 + y^2 = 16$
   (b) $x^3y + 4y = 12$
   (c) $y^3 - x = 1$

5. Find the domains of the following functions.
   (a) $f(x) = \frac{x^3}{\sqrt{x^2 - 9}}$
   (b) $f(x) = \frac{\sqrt{x^2 - 6x - 16}}{x^2 + 4x - 21}$

6. Let $f(x) = \frac{x^2 + 1}{2 - x}$. Evaluate the following.
   (a) $f(\frac{1}{2})$
   (b) $f(-x^2)$

7. Consider the function:
   $f(x) = \begin{cases} 
   -\frac{1}{2}x + 2 & \text{if } x \leq -1 \\
   x^2 & \text{if } -1 < x \leq 1 \\
   3 & \text{if } 1 < x < 4
   \end{cases}$
   (a) Graph the function.
   (b) What are the domain and range of $f$?
   (c) On what intervals is $f$ increasing? decreasing?

8. Graph the function $f(x) = |x^2 - 4|$ by plotting points.
9. Graph the function \( f(x) = x^4 - 5x^3 - 3x^2 + 17x - 10 \) using a graphing calculator.

   (a) What is the range of this function? (Round decimals to 4 places.)
   (b) On what intervals is \( f \) increasing? decreasing? (Round decimals to 4 places.)

10. Find the average rate of change for the following functions on the given interval.

   (a) \( f(x) = \sqrt{x + 8} \) from \( x = -4 \) to \( x = 1 \)
   (b) \( f(x) = x^2 + 2x - 4 \) from \( x = 2 \) to \( x = 2 + h \)
   (c) \( f(x) = \frac{5}{x-4} \) from \( x = a \) to \( x = a + h \)

11. Suppose an object is launched into motion. After 10 seconds, the object has traveled 220 feet. After 15 seconds, the object has traveled a total of 450 feet.

   (a) What was the object’s average speed during the first 10 seconds?
   (b) What was the object’s average speed during the last 5 seconds?

12. If the distance in feet an object has traveled after \( t \) seconds is modeled by the function \( f(t) = t^3 + 6t \), then what is the object’s average speed from \( t = a \) to \( t = a + h \)?