1. Find the slope intercept equation of the line through the point \((-2,5)\) and

(a) parallel to the line \(2x - y + 4 = 0\)

(b) perpendicular to the line \(x = 3\).

2. The population of a small town in central Pennsylvania was 8000 in the year 2010, and had decreased to 7500 by the year 2015. Find a linear model giving the population \(P\) in terms of the year \(t\), where \(t = 0\) corresponds to the year 2010.
3. Determine if the equation represents a function of $y$ in terms of $x$. If it is not a function, explain your reasoning.

a. $y^2 - x^2 = 16$

   *yes or no, if no, explain.*

b. $y = 4x^2 - 1$

   *yes or no, if no, explain*

4. Sketch a graph of the function. $f(x) = \begin{cases} 
  x + 1, & x < 0 \\
  x^2 - 4, & x \geq 0 
\end{cases}$
5. Determine if the statement is true T or false F. If false, explain why it is false or provide a counter-example.

a. The graph of an odd function is symmetrical to the x-axis. ____________
If false, explain.

b. The graph shown is that of the greatest integer function, \( f(x) = \lfloor x \rfloor \) ____________
If false, explain.

6. Use the graph of \( y = f(x) \) to find the following:

(a) domain of \( f \) ______________

(b) range of \( f \) ______________
7. For the function \( f(x) = x^2 - 3x + 5 \), find and simplify the difference quotient.

\[
\frac{f(x + h) - f(x)}{h} =
\]

8. Use the graph of \( f(x) = |x| \) to write the equation for the function \( g \) whose graph is shown.

*Assume no vertical stretch or shrink.*
9. **Describe** the shape and the rigid transformations that gives the graph of
   \[ g(x) = -\frac{1}{4} (x - 3)^2 - 2 \] using the graph of \( f(x) = x^2 \). Not looking for a graph, but a written description.

10. Find each of the following for the given functions,
   \[
   f(x) = x^2 + 1 \\
   g(x) = 2x - 3
   \]

   a. \((f \cdot g)(x)\)  
   b. \((f - g)(x)\)
11. For the composite function, \( f(g(x)) \) find two functions \( f \) and \( g \), if \( f(g(x)) = \sqrt{4x-5} \)

\[ f(x) = \]

\[ g(x) = \]

12. Find \( f^{-1}(x) \), if it exists, for \( f(x) = 27x^3 - 1 \). If it does not exist, explain the reason(s).

13. (4 points): 4 points: Any plans for Valentine’s Day?
Extra: Use the graph of \( f \) and \( g \) to find each of the following:

\[ g(f(1)) = \]

\[ (f + g^{-1})(3) = \]

\[ (g \circ f^{-1})(3) = \]

\[ g^{-1}(g(1)) = \]

Happy Valentine’s Day