1. Find an equation of the line that passes through the points (2, 3) and (2, -5). (1 point)

2. (a) Suppose $f$ is a linear function such that $f(0) = 6$ and $f(3) = 4$. Find $f(x)$. (1 point)
   (b) Suppose $f$ is a linear function with slope 2 and such that $f(-3) = 8$. Find $f(x)$. (1 point)

3. Given the quadratic function $f(x) = x^2 - 8x + 13$.
   (a) Find the vertex. (1/2 point)
   (b) Find an equation of axis of symmetry. (1/2 point)
   (c) Find the range of $f$. (1/2 point)
   (d) Find the $y$-intercept. (1/2 point)
   (e) Sketch the graph. (1 point)

4. Figure below shows the graph of $y = f(x)$. 

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**ICNS100 Midterm, T3/2013-14**

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4. Figure below shows the graph of $y = f(x)$.
(a) \( f(1) = \) \( \frac{1}{2} \) point

(b) What is the domain of \( f \)? \( \frac{1}{2} \) point

(c) What are the \( x \)-intercepts? 1 point

5. Find a general linear form of a line that passes through \((-7, -5)\) and is parallel to the line \( x + 4y = y - x + 6 \). 2 points

6. Solve the following system of equations.

\[
\begin{align*}
3x + 4y + z &= 9 \\
18x - y + 6z &= 4 \\
\end{align*}
\]

Write your answer in a parametric form if necessary. 3 points

7. Sketch the graph of \( y = \begin{cases} x^2 - 1 & \text{if } 0 \leq x < 2 \\ 2x - 4 & \text{if } 2 \leq x < 4 \end{cases} \) 2 points
8. Suppose \( f(x) \) is a linear function given by \( f(x) = \frac{3x - 2}{5} + 1 \). Find the slope and the \( y \)-intercept. (1 point)

9. Test whether the graph of \( x^2 = y|y| + 16 \) is symmetric about
   (a) the \( y \)-axis, (2 points)
   (b) the origin.

10. The demand function for a manufacture’s product is \( p = f(q) = 600 - 10q \) where \( p \) is the price per unit when \( q \) units are demanded by consumers. Find the level of production that will maximize the manufacture’s total revenue and also determine the maximum revenue. (3 points)

11. The graph of \( y = f(x) \) is shown below.

12. Find the slope-intercept form of the line that has \( x \)-intercept 2 and is perpendicular to the line \( x + 2y - 1 = 0 \). (2 points)

13. Solve the following non-linear system.

\[
\begin{align*}
x + y &= -3 \\
x^2 + y^2 &= 17.
\end{align*}
\] (3 points)
14. Suppose the variables $p$ and $q$ are linearly related such that $p = 3$ when $q = 20$, and $p = 5$ when $q = 15$. Find $p$ when $q = 12$. (1 point)

15. Suppose that consumers will demand 100 units of a product when the price is $10$ per unit, and 120 units when the price is $8$ per unit. Assuming that price $p$ and quantity $q$ are linearly related, find

(a) the equation of $p$ in terms of $q$, (1 point)
(b) the price at which 90 units are demanded. (1 point)

16. Solve the following system of equations.

\[
\begin{align*}
  x + y + z &= 6 \\
  2y + 5z &= -4 \\
  2x + 5y - z &= 27.
\end{align*}
\]

Write your answer in a parametric form if necessary. (3 points)