1. Find the equation of the line through the point: \((-4, 1)\), and:

a. parallel to the line \(y = -\frac{3}{2}x - 5\)  

b. perpendicular to the line \(x = 4\)

2. In the year 2000 the number of toys on the Island of Misfit toys was 50 toys, and in the year 2010 the number of toys had decreased to 0. Find a linear model giving the number of toys, \(N\) in terms of the year \(t\) where \(t = 0\) corresponds to the year 2000.

3. Describe (in words) the shape of the graph, and the transformation(s) of the graph, of the function, \(h(x) = -2(x + 1)^2 - 3\) relative to the graph of \(f(x) = x^2\).

4. Use the graph of the function, \(y = f(x)\) to find each of the following:

   a. domain: __________

   range: __________

   b. Interval(s) on which \(f\) is increasing: __________

   Interval(s) on which \(f\) is decreasing: __________

   c. \(f(3) = \)

   d. value(s) of \(x\) such that \(f(x) = 0\), \(x = \) __________

5. Use the functions: \(f(x) = 2x - 3\) and \(g(x) = x^2 + 1\) to find the following:

   a. \(f(t - 2) = \)

   b. \(f(w) - g(w) = \)

   c. \(f(h + 2) - f(2) = \)
6. Given the composite function \( h(x) = f(g(x)) \) find two functions \( f \) and \( g \), such that
\[
h(x) = f(g(x)) = \sqrt{2x - 1}
\]
\[
f(x) = \quad \text{and} \quad g(x) =
\]

7. A reindeer rancher is enclosing a rectangular field for his herd of aerodynamically challenged herd to graze with 4000 feet of fencing. Because the pasture is adjacent to an existing stone wall, no fencing is needed along that side of the field. Find the dimensions that will enclose the greatest area.

\[
\text{Primary Equation: } \quad \text{Constraint Equation: }
\]

Solution:

8. Find all real zeros of the function by factoring: \( f(x) = x^4 - 13x^2 + 12 \)

9. For the function, \( f(x) = x^3 - 3x^2 + x + 1 \), use the graph, synthetic division, factoring, and/or the quadratic formula to algebraically find all real zeros.

10. Find the equation(s) of the vertical asymptote(s), and horizontal asymptote(s), if any, of the graph of the function, \( f(x) = \frac{x^2 - 25}{x^2 - 16} \).

\[
\text{Vertical Asymptote(s):} \quad \text{Horizontal Asymptote(s):}
\]
11. Use the appropriate formula in Problem #2. \[ A = P (1 + \frac{r}{n})^{nT} \quad \text{and} \quad A = Pe^{rt} \]

Suppose very rich and very eccentric great Aunt Sofia Maria deposited $120,000 into an account the day that you were born. Find the amount in that account on your 21st birthday, if the interest rate was 3% and the interest was compounded,

a. Monthly. \hfill \text{b. Continuously.}

12. Solve the exponential equation for \( x \):
\[ 2e^{-x} - 1 = 0 \]
Leave your answer in terms of natural logarithms. Then round to three decimal places.

13. Use the properties of logarithms to expand and/or simplify the expression:
\[ \ln(x^3 \sqrt{x^2 + 1}) \]

14. The population of a rare species of crimson clothed jolly fellow with snow white facial whiskers on a subtropical island is increasing exponentially. Find the exponential model, \( y = ae^{kt} \) if there were 100 of this species on the island in 2000, and there are 200 in 2010. Let \( y \) be the number of species and \( t \) be the year with \( t = 0 \) corresponding to 2000. Then use the model to predict the number of flies in the year, 2015.

15. Label the right triangle to evaluate, assume the angle is acute.

\[ \csc \theta = \frac{7}{2} \]

Find \( \cos \theta \).

16. The angle of elevation from a point 100 feet from the base to the top of a Hello Kitty Macy’s Thanksgiving Day parade balloon is approximately 32°. Find the approximate height of the balloon.

17. Find \( \sin \theta \) given the terminal side of \( \theta \) passes through the point \((2, -3)\).
18. Evaluate the trigonometric function without using a calculator:

a. \( \sin 300^\circ = \)  
b. \( \cos 135^\circ = \)

19. Evaluate the trigonometric function without using a calculator:

a. \( \tan \frac{4\pi}{3} = \)  
b. \( \sin \frac{5\pi}{6} = \)

20. If possible, evaluate the trigonometric function of the quadrant angle.

a. \( \tan \frac{3\pi}{2} = \)  
b. \( \sin 180^\circ = \)

21. Find two solutions in radians \((0 \leq \theta \leq 2\pi)\) of the equation without using a calculator:

\[ 2 \sin \theta + 1 = 0 \]

22. Determine the following for graph of \( y = 4 \sin(2x - \pi) \).

- amplitude: \( \ldots, \ldots \)  
- period: \( \ldots, \ldots \)  
- key points: \( \ldots, \ldots \)  
- starting point (phase shift): \( \ldots, \ldots \)  
- end point: \( \ldots, \ldots \)  

23. Find each of the following without using a calculator.

a. \( \arcsin \left( \frac{1}{2} \right) = \)  
b. \( \arccos \left( -\frac{\sqrt{3}}{2} \right) = \)

24. Solve for \( \theta \), in radians \( 0 \leq \theta \leq 2\pi \) without using a calculator. \( \cos^2 \theta - \sin \theta - 1 = 0 \)

25. Solve for \( \theta \), in radians \( 0 \leq \theta \leq 2\pi \) without using a calculator. \( \cos 2\theta = 0 \)