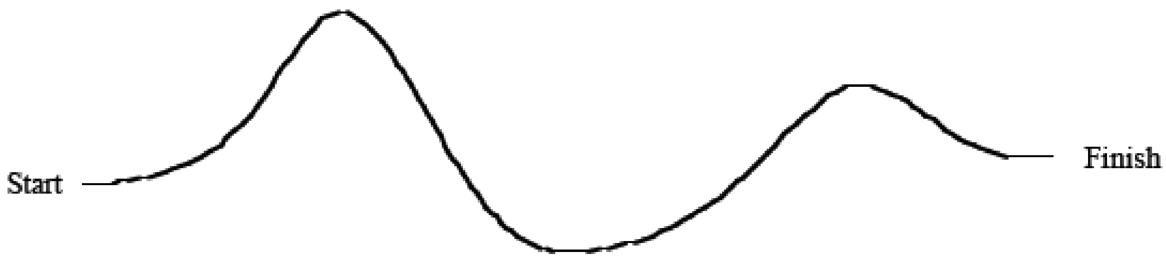
1-110. The path of the roller coaster is shown below.



a. Describe the path so that someone who has not seen it can draw it. Be sure to include words that will help to describe the steepness of the curve as well as its direction.

b. When writing slope statements, it is reasonable to start at the left of the graph and move right---just as you would read a sentence in English. Make a list of words that are useful when describing the path of a graph.

1-111. The following two slope statements describe the *same* function. Read both statements. Then sketch a graph of the function described.

> *"The graph starts off flat at the left and starts to increase at* $x = -3$ *until the function flattens out at* $x = 0$. *Then the value of y decreases until the function flattens out around* $x = 2$ *and continues flat."*
>
> *"The graph starts off flat at the left but slowly gets steeper. The slope starts getting really steep at* $x = -2$, *but at* $x = -1$, *the slope starts to get less steep. At* $x = 0$, *the slope is flat for an instant and then gets steeper but negative. At* $x= 1$, *the slope starts to become less steep again, eventually getting closer and closer to zero slope."*

1-112. Finite differences can be used to analyze the slope of a graph at various x-values. Some graphs have predictable slope patterns. For example, in Lesson 1.3.1, you found consistent patterns in the way polynomial functions change. For example, cubic functions change with a quadratic pattern, quadratic functions change with a linear pattern, and linear functions change with a constant pattern. What about other functions?

Your team will be assigned one of the function groups listed below to investigate. For the two equations in your function group, complete the following takes:

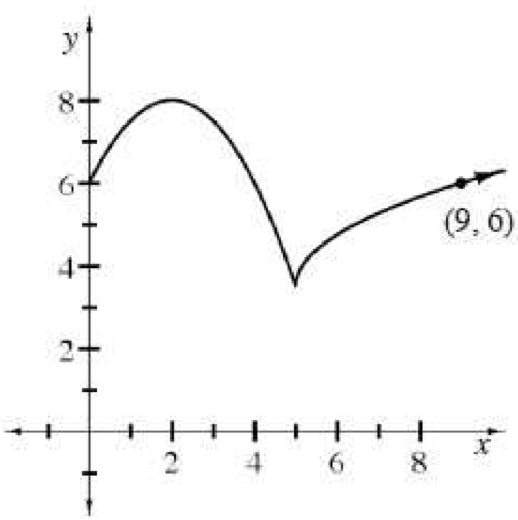
- Graph the function.
- State the domain and range using appropriate notation.
- Analyze the finite differences.
- Write a slope statement.

Function Group	Equation (a)	Equation (b)

Rational	$f(x)=\frac{1}{x}$	$f(x)=\frac{1}{x^2}$
Trigonometric	$f(x) = \sin x$	$f(x) = \cos x$
Exponential	$f(x) = (0.5)^x$	$f(x) = 2^x$
Logarithmic	$f(x) = \log x$	$f(x) = \log_2 x$
Radical	$f(x)=\sqrt{x}$	$f(x)=\sqrt[3]{x}$

Review & Preview

1-113. Create a piecewise defined function that will generate the graph below. Homework Help ✎



1-114. State the domain for each of the following functions. Homework Help ✎

a. $f(x)=\sqrt{25-x^2}$

b. $g(x)=\log(x+5)$

c. $h(x)=\frac{5x}{x^2-x-12}$

d. $k(x)=\frac{\sqrt{x+2}}{x^2-4}$

1-115. Simplify: $\left(\left(\frac{x^{-1}+x^{2}}{x}\right)-x+x^{-2}\right)^{-2}$ Homework Help ✎

MATH NOTES

Common Trigonometric Identities

Reciprocal

$\sec x=\frac{1}{\cos x}$ $\csc x=\frac{1}{\sin x}$

$\tan x=\frac{\sin x}{\cos x}$ $\cot x=\frac{\cos x}{\sin x}$

Pythagorean

$\sin^2 x+\cos^2 x=1$

$\tan^2 x+1=\sec^2 x$

$1+\cot^2 x=\csc^2 x$

Angle Sum

$\sin(a\pm b)=\sin a\cos b\pm\cos a\sin b$

$\cos(a\pm b)=\cos a\cos b\pm\sin a\sin b$

Double Angle

$\sin 2a=2\sin a\cos a$

$$\cos 2a=\begin{cases}\cos^2 a-\sin^2 a\\ 2\cos^2 a-1\\ 1-2\sin^2 a\end{cases}$$

1-116. Calculus problems often require using one or more of the trigonometric identities to solve problems. Solve each of the following equations where $x\in[0,2\pi]$. Use exact values. Homework Help ✎

a. $\tan x\cdot\csc x=2$

b. $\sin x\cdot\cos x=\frac{1}{4}$

c. $2\sin^2 x - \cos x - 1 = 0$

d. $\tan x + \cot x = -2$

1-117. For each part below, give an example of a function with specified attributes. Provide a sketch of each function. Homework Help ✎

a. A function with a hole at $x = 3$ and an asymptote at $x = -1$.

b. A function with asymptotes at the y-axis and $x = 5$ and a hole at $x = -4$.

c. A function with an end behavior function $g(x) = 3x - 1$.

1-118. Some of your parent graphs have special qualities that we have studied in this chapter. 1-118 HW eTool (Desmos). Homework Help ✎

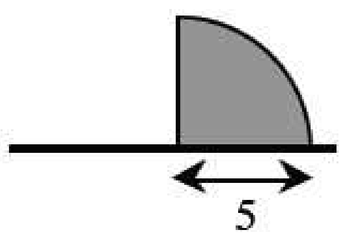
a. Sketch $y = \sin x$ on your paper. Darken in the largest portion of the graph containing $x = 0$ for which the function passes both the horizontal and vertical line tests. State the restricted domain and range for this portion of the graph.

b. We use the darkened portion of the graph to sketch $\sin^{-1} x$, making sure it is a function. Then state the domain and range.

c. Repeat parts (a) and (b) for $y = \cos x$.

1-119. The function $g(x)$ is even. What can you conclude about the inverse of $g(x)$? Explain. Homework Help ✎

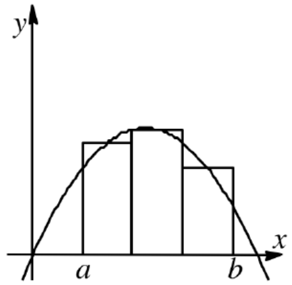
1-120. A flag in the shape of a quarter-circle is shown below. Homework Help ✎



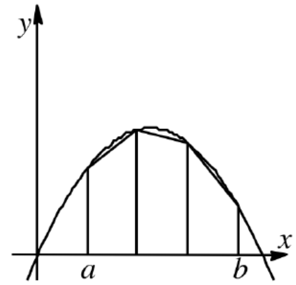
a. Imagine rotating the flag about its pole and describe the resulting three-dimensional figure. Draw a picture of this figure on your paper.

b. Find the volume of the rotated flag.

1-121. WHICH IS BETTER? Part Two
Below is a comparison between using rectangles and trapezoids to approximate the *same* area under a curve for $f(x)$. Decide which method you think will best approximate $A(f, a \le x \le b)$. Then approximate each area if $f(x) = -0.25x(x - 9)$, $a = 2$, and $b = 8$ using 3 sections. Compare your results with the actual area A= 25.5 square units. Homework Help ✎



Midpoint Rectangles



Trapezoids