

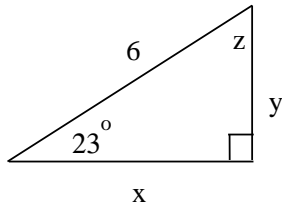
1. Given the points  $A : (4, -2)$  and  $B : (-2, 7)$ :
  - (a) Find the distance between  $A$  and  $B$
  - (b) Find an equation for the line containing  $A$  and  $B$
  - (c) Find the line that is perpendicular to the line you found in part (b) and containing the point  $(1, -1)$
2. Find solutions to the following inequalities. Give your solutions in interval notation.
  - (a)  $\frac{x^2 - 1}{x^2 + x - 6} \leq 0$
  - (b)  $|2 - 3x| + 4 > 11$
3. Given the function  $f(x) = \frac{1}{x - 2}$ 
  - (a) What is the domain of  $f$ ? Give your answer in interval notation.
  - (b) Find  $f(5)$  and  $f(2a + 4)$
  - (c) Find  $\frac{f(a + h) - f(a)}{h}$  (be sure to simplify your answer).
4. Given that  $f(x) = \frac{1}{2x - 3}$  and  $g(x) = \sqrt{x^2 - 9}$ 
  - (a) Find  $\frac{g}{f}(x)$
  - (b) Find  $g \circ f(x)$
  - (c) Find  $f \circ g(2)$
  - (d) Find the domain of  $\frac{g}{f}$ ? Give your answer in interval notation.
5. Determine whether the following functions are even, odd, or neither:
  - (a)  $f(x) = x^3 - x$
  - (b)  $g(x) = (x^3 - x^x)^2$
  - (c)  $h(x) = x^3 \sin x$
6. Find the exact value of each of the following:
  - (a)  $\sin\left(\frac{7\pi}{4}\right)$
  - (b)  $\cos\left(\frac{4\pi}{3}\right)$
  - (c)  $\cos\left(-\frac{53\pi}{2}\right)$
  - (d)  $\sin^{-1}\left(\frac{1}{\sqrt{2}}\right)$
  - (e)  $\cos^{-1}(-1)$
  - (f)  $\sin^{-1}\left(-\frac{\sqrt{3}}{2}\right)$

7. Find all solutions to the following equations. Give the exact answers.

(a)  $2 \sin 3x = \sqrt{3}$

(b)  $\sin^2(x) - \sin(x) = 0$

8. Find the values of  $x$ ,  $y$  and  $z$  in the triangle shown below:



9. For each function below, find the amplitude and period of the function, and then carefully draw the graph of the function.

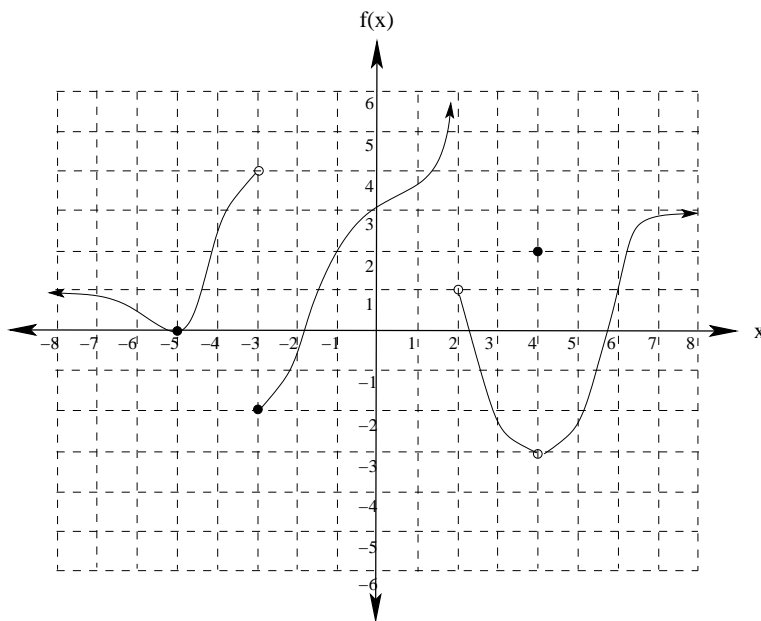
(a)  $y = 2 \sin(3x) + 2$

(b)  $y = 3 \cos(x - \frac{\pi}{3})$

10. Verify the following identity by transforming the left hand side into the right hand side:

$$\frac{1}{1 - \sin x} - \frac{1}{1 + \sin x} = 2 \tan x \sec x$$

11. A function  $f$  is graphed below. Find the following:



(a)  $f(-5)$ ,  $f(-3)$ , and  $f(4)$

(b) find the domain and range of  $f$

(c) find the intervals where  $f$  is decreasing

(d) find  $\lim_{x \rightarrow 4} f(x)$

(e) find  $\lim_{x \rightarrow 2^-} f(x)$  and  $\lim_{x \rightarrow 2^+} f(x)$

(f) find  $\lim_{x \rightarrow -\infty} f(x)$  and  $\lim_{x \rightarrow \infty} f(x)$

(g) find the points where  $f(x)$  is discontinuous, and classify each point of discontinuity.

12. Evaluate the following limits:

(a)  $\lim_{x \rightarrow 2} \frac{3x + 7}{\sqrt{5x - 1}}$

(b)  $\lim_{x \rightarrow \frac{3}{2}} \frac{2x^2 + x - 6}{4x^2 - 4x - 3}$

(c)  $\lim_{x \rightarrow 2} \frac{x^4 - 16}{x^2 - x - 2}$

(d)  $\lim_{x \rightarrow 0^+} \frac{1}{\sqrt{x}}$

(e)  $\lim_{x \rightarrow \infty} \frac{(3x - 5)(2x - 3)}{(x + 7)(5x - 2)}$

13. Given the function

$$f(x) = \begin{cases} x^2 & \text{if } x < 1 \\ 2 & \text{if } x = 1 \\ 4 - x^2 & \text{if } x > 1 \end{cases}$$

(a) Graph  $f(x)$ .

(b) Find  $\lim_{x \rightarrow 1^-} f(x)$ ,  $\lim_{x \rightarrow 1^+} f(x)$ , and  $\lim_{x \rightarrow 1} f(x)$

(c) Is  $f(x)$  continuous at  $x = 1$ ? Justify your answer.

14. Given that  $f(x) = x^3 + 5$ ,  $\lim_{x \rightarrow 2} f(x) = 13$ , and  $\epsilon = .01$ , find the largest  $\delta$  such that if  $0 < |x - 2| < \delta$ , then  $|f(x) - 13| < \epsilon$ .

15. Use the formal definition of a limit to prove that  $\lim_{x \rightarrow 6} 5x - 21 = 9$ .

16. Let  $f(x) = \frac{x^2 - x - 2}{x^2 - 2x}$ .

(a) Find the values of  $x$  at which  $f$  is discontinuous.

(b) Find all vertical and horizontal asymptotes of  $f$ .

17. Find the  $x$  values at which  $f(x) = \frac{\sqrt{9 - x^2}}{x^4 - 16}$  is continuous.

18. Use the Intermediate Value Theorem to show  $x^5 - 3x^4 - 2x^3 - x + 1 = 0$  has a solution between 0 and 1.