

Graded Homework Set 1 -- Calculus I -- Math191 (Page references in red)

1. Jason leaves Detroit at 2 p.m. and drives at a constant speed west along I-96. He passes Ann Arbor, 40 miles from Detroit, at 2:50 p.m.. (see section 1.2)

a. Express the distance traveled in terms of the time elapsed.

b. Draw the graph of the equation in part (a). Use  $t$  for time on the abscissa ( $x$ -axis) and  $s$  for distance traveled on the ordinate ( $y$ -axis) with  $t$  in hours and  $s$  in miles.

c. What is the slope of this line, and what does it represent?

2. Consider the function  $y = f(x) = x^3$ . (See examples 1 and 2 pages 61 and 62)

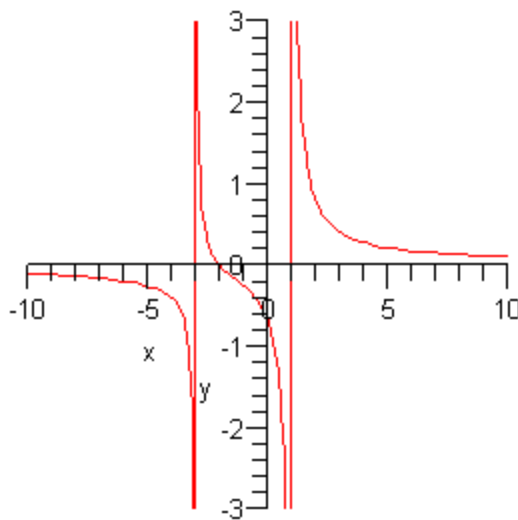
a. What is the slope of the secant line connecting the points  $(1, 1)$  and  $(3, 27)$ ?

b. What is the slope of the tangent line at the point  $(1, 1)$ ?

c. What is the equation of the tangent line at the point  $(1, 1)$ ?

3. Consider the function  $y = f(x)$  shown below whose equation is

$$y = f(x) = \frac{x+2}{(x-1)(x+3)} : \text{(See section 2.2)}$$



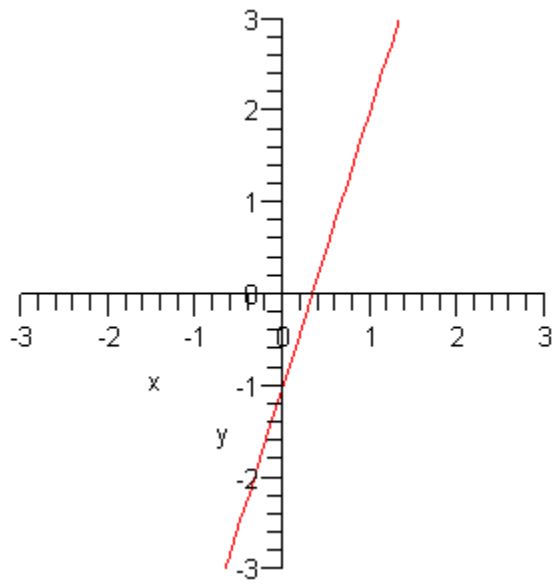
Evaluate the following limes:

a.  $\lim_{x \rightarrow 0} f(x)$     b.  $\lim_{x \rightarrow -2} f(x)$     c.  $\lim_{x \rightarrow 1^+} f(x)$     d.  $\lim_{x \rightarrow -3} f(x)$     e.  $\lim_{x \rightarrow \infty} f(x)$

4. Evaluate the following limits: (See section 2.3)

a.  $\lim_{x \rightarrow -2} (x^2 - 5x + 1)$     b.  $\lim_{x \rightarrow 2} \frac{x^2 + x - 6}{x - 2}$     c.  $\lim_{h \rightarrow 0} \frac{(2+h)^3 - 8}{h}$

5. Consider the graph of  $y = 3x - 1$  shown below. How close to  $x = 1$  do we have to be so that  $y$  is within 0.02 units of 2? (See section 2.4)



6. Explain why the function  $y = 3^{x-1}$  is continuous at  $x = 1$ .  
(See page 97 and section 2.5)

7. Explain why the function  $f(x) = \begin{cases} \frac{1}{x-1} & \text{if } x \text{ does not equal } 1 \\ 2 & \text{if } x \text{ does equal } 1 \end{cases}$  is discontinuous at the point  $x = 1$ . (See page 97 and section 2.5)

8. a. Sketch the graph of  $y = f(x) = \frac{(x+2)(x-1)}{(x-4)}$ .  
 b. For what values of  $x$  is the function not defined?  
 c. For what values of  $x$  is  $y = 0$ ?  
 d. Find the limit on  $f(x)$  as  $x$  approaches 4 from the positive side.

(See page 98 and section 2.5 and section 4.5)

9. Sketch the graph of an example of a function that satisfies all of the following conditions:

$$\lim_{x \rightarrow 0^+} f(x) = -2 \text{ and } \lim_{x \rightarrow 0^-} f(x) = 1 \text{ and } \lim_{x \rightarrow 2^+} f(x) = -\infty \text{ and } \lim_{x \rightarrow 2^-} f(x) = \infty$$

and  $f(0) = -1$  (See problem 1 page 109)

10. Find  $\lim_{x \rightarrow 0} \cos(x + \sin x)$  (See page 102)