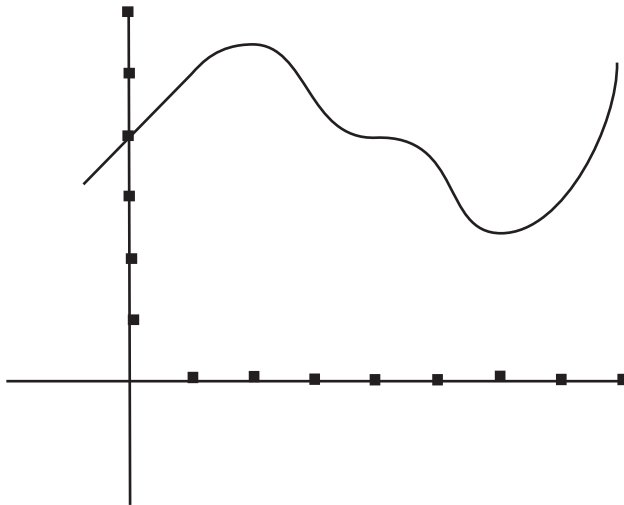


Math 30  
Practice for Exam 1

1) Use the definition of the derivative to determine whether or not the function  $f(x) = 2x|x| + 3$  is differentiable at  $x = 0$ . If it is differentiable at  $x = 0$ , find  $f'(0)$ .

2) The graph of  $f(x)$  is given below. Draw the graph of  $f'(x)$ . Label all the coordinates of all relevant points.



3) Let  $f(x) = \frac{(2x-1)^2}{(x-2)(x+2)}$ . Evaluate the following limits. For each limit either show your work or write a sentence explaining how you arrived at your answer.

a)  $\lim_{x \rightarrow -2^-} f(x)$

b)  $\lim_{x \rightarrow -2^+} f(x)$

c)  $\lim_{x \rightarrow \infty} f(x)$

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

4) Evaluate the limit.

$$\lim_{t \rightarrow 0} \frac{\sin^3(5t)\cos(7t)}{t^2 \tan(4t)}$$

5) Find the derivative of the function

$$\sqrt{\frac{1 - \sec(x)}{1 + \tan(x)}}$$

6) Find  $y''$  at the point  $(3, 2)$  for the function given implicitly by the equation  $y^3 + y = x^2 + 1$ .

7) Let

$$f(x) = \frac{3}{\sqrt{1+x} + \sqrt{5x}}$$

and suppose that  $h(x)$  is a differentiable function such that  $h(0) = 1$ ,  $h(1) = 0$ ,  $h(2) = 5$ ,  $h'(0) = 2$ ,  $h'(1) = -1$ ,  $h'(2) = 2$ . Find the derivative of the function  $f(h(x))$  at  $x = 2$ .

8) Find the equation (or equations) of all lines through the point  $(0, 2)$  which are tangent to the curve  $y = x^3$ .