

**Instructions:** This homework is an individual effort. Answer each question. This is due on **Monday, February 10th. Show all work to receive full credit.**

1. For each of the following, graph a differentiable function  $f(x)$  satisfying (at a point  $c$ ):
  - a.  $f(c) > 0$  and  $f'(c) > 0$
  - b.  $f(c) > 0$  and  $f'(c) = 0$
  - c.  $f(c) > 0$  and  $f'(c) < 0$
  - d.  $f(c) = 0$  and  $f'(c) > 0$
  - e.  $f(c) = 0$  and  $f'(c) = 0$
  - f.  $f(c) = 0$  and  $f'(c) < 0$
  - g.  $f(c) < 0$  and  $f'(c) > 0$
  - h.  $f(c) < 0$  and  $f'(c) = 0$
  - i.  $f(c) < 0$  and  $f'(c) < 0$
  
2. Suppose  $f(x) = x^2$ . Which of the following properties from 1(a)-1(d) does  $f(x)$  satisfy at:
  - $x = 0$
  - $x = -2$
  - $x = 5$
  
3. Repeat problem (2) for  $f(x) = x^5$ .
  
4. Repeat problem (2) for  $f(x) = \sqrt{x}$ , for the values  $x = 0$  and  $x = 5$  only.
  
5. Repeat problem (2) for  $f(x) = \ln(x)$ , for the values  $x = 1$ ,  $x = 1/e$ , and  $x = 5$ .
  
6. For each problem, find the tangent line and use it to approximate the function at the given  $x$ -value.
  - a.  $f(4) = 5$  and  $f'(4) = 7$ . Approximate  $f(4.02)$ . Then approximate  $f(3.92)$ .
  - b.  $f(5) = 3$  and  $f'(5) = -2$ . Approximate  $f(5.03)$ .
  - c.  $f(2) = -4$  and  $f'(2) = 3$ . Approximate  $f(1.95)$ .