

HW 1 – Rates of Change; Local Linearity  
AB Calculus – Mr. Oberle

1. Consider the function  $y = 1 + x + 3x^2$ .
  - a. Find the average rate of change of this function between  $x = 1$  and  $x = 3$ .
  - b. Is this function locally linear at  $x = 2$ ? Why or why not?
  - c. If this function is locally linear at  $x = 2$ , find the instantaneous rate of change there.
  - d. If this function is locally linear at  $x = 2$ , find the equation of the tangent line there.
  
2. Consider the function  $y = |x|$ .
  - a. Find the average rate of change of this function between  $x = -1$  and  $x = 3$ .
  - b. Is this function locally linear at  $x = 3$ ? Why or why not?
  - c. If this function is locally linear at  $x = 3$ , find the instantaneous rate of change there.
  - d. If this function is locally linear at  $x = 3$ , find the equation of the tangent line there.
  
3. Consider the point on  $y = \sin x$  where  $x = \frac{\pi}{3}$  (use radians!).
  - a. Is this function locally linear at this point? Why or why not?
  - b. Estimate the equation of the tangent line at this point.
  
4. Consider the function  $y = \sqrt{x}$ .
  - a. Find the average rate of change of this function between  $x = 4$  and  $x = 9$ .
  - b. Find the instantaneous rate of change of this function at  $x = 4$ .
  - c. Find the tangent line to this function at  $x = 4$ .
  - d. Find the instantaneous rate of change of this function at  $x = a$ . For which values of  $a$  does this calculation make sense?
  - e. Find the tangent line to this function at  $x = a$ .