

1. Let  $g(x) = x^2 - 4x$ .
  - a. Find the value of  $x$  for which the tangent line to  $y = g(x)$  has slope equal to 6.
  - b. Find the value of  $g(x)$  at the point where the tangent line to  $y = g(x)$  is parallel to  $y = 2x + 5$ .
  - c. Find a value of  $x$  so that the instantaneous rate of change of  $g$  at  $x$  is equal to the average rate of change of  $g$  from  $x = -1$  to  $x = 3$ .
  
2. An object is launched up in the air. The height of the object after  $t$  seconds is  $P(t)$  feet, where  $P(t) = -16t^2 + 256t + 64$ .
  - a. When is the object at its greatest height? (Hint: What must be true about the velocity of the object when it is at the greatest height?)
  - b. What is the maximum height of the object?
  
3. Suppose  $q(x) = 3x^2 - 12x + 8$  and  $p(x) = 3x^2 - 12x + 5$ .
  - a. Find  $q'(x)$  and  $q'(1)$ .
  - b. Find the equation of the tangent line to  $y = q(x)$  at  $x = 1$ .
  - c. Find  $p'(x)$  and  $p'(1)$ .
  - d. Find the equation of the tangent line to  $y = p(x)$  at  $x = 1$ .
  - e. What do you notice when you compare your answers? Draw the graphs of  $y = p(x)$  and  $y = q(x)$  and explain what you've found.