

Calculus BC  
Lesson 2.6 openers

1. Consider the function  $y = \sqrt{4x+1}$  near the point  $(2, 3)$ .
  - a) Find the slope of the secant line to the function at  $(2, 3)$  that also passes through the point where  $x = 1$ .
  - b) Find the slope of the secant line to the function at  $(2, 3)$  that also passes through the point where  $x = 3$ .
  - c) Find the slope of the secant line to the function at  $(2, 3)$  that also passes through the point where  $x = a$ .
  - d) Find the slope of the tangent line to the function at  $(2, 3)$ .
  - e) Write an equation for the tangent line to the function at the point  $(2, 3)$ .
  - f) Graph the function and the tangent line in the same window on your calculator.
  
2. The height of a rocket at time  $t \geq 0$  is given by  $80t - 12t^2 + 8$ .
  - a) Find the average velocity of the rocket from time  $t = 4$  to  $t = 5$ .
  - b) Find the average velocity of the rocket from time  $t = 4$  to  $t = a$ .
  - c) Find the velocity of the rocket at time  $t = 4$ .

3. Consider the following definitions of the slope of the tangent line to  $f(x)$  at  $x = a$ :

(i)  $\text{slope} = \lim_{x \rightarrow a} \frac{f(x) - f(a)}{x - a}$

(ii)  $\text{slope} = \lim_{h \rightarrow 0} \frac{f(a+h) - f(a)}{h}$

Explain!

4. Use the definition(s) above to find an equation for the tangent line to the graph at the given point.

a)  $f(x) = \frac{1}{4x}$  at  $x = 2$

b)  $y = x^3 + 3x$  at  $x = -1$

c)  $f(x) = \frac{2}{\sqrt{3x-5}}$  at  $x = 3$