Keeper 3.2 – The Definition of the Derivative

Virtual Problems

DEFINITION OF A DERIVATIVE

$$\frac{dy}{dx} = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$$

1. Find the slope of the tangent line at $x = 3$
   $f(x) = \dfrac{5}{3x - 4}$

2. Find the slope of the normal line at $x = 5$
   $f(x) = \sqrt{2x - 1}$

3. Find the derivative:
   $f(x) = x^2 + 2$

4. Find the derivative:
   $f(x) = \dfrac{1}{x}$

5. Find the derivative:
   $f(x) = 2\sqrt{x + 3}$

6. Find the derivative:
   $f(x) = \dfrac{1}{\sqrt{x + 1}}$

Example: Derivative from a chart

7. The traffic speed S along a certain road (in mph) varies as a function of traffic density q (number of cars per mile on the road). Estimate the instantaneous rate of change at $q = 110$.

q (density)	100	110	120	130	140
S (Speed)	45	42	39.5	37	35

Examples: State the x values where f is not differentiable and the reason.

8.