Keeper 3.1 – The Average Rate of Change & Definition of a Derivative at a Point

Virtual Practice Problems

1. If a rock falls from the roadway, the function $s = f(t) = 16t^2$ gives the distance s, in feet, that the rock falls after t seconds for $0 \leq t \leq 7.458$. Here $7.458s$ is the approximate time it takes the rock to fall 890 ft into the river. Find the average velocity of the rock during its fall.

2. Let $f(x) = x^3 - x^2 - 6x$. Find the average rate of change over $[1,3]$.

3. Find the difference quotient of $f(x) = \sqrt{2x}$ from $x = 2$ to $x = 8$

Examples: Find the Derivative at the Given Point

4. $f(x) = x^2 - 2$ at $x = 0$

5. $f(x) = \frac{1}{x}$ at $x = 3$

6. $f(x) = \frac{1}{x^2}$ at $x = 2$

7. $f(x) = \frac{1}{\sqrt{x}}$ at $x = 9$

Find the Derivative of the function at the given point. Then find the equation of the tangent and normal line.

8. $f(x) = \sqrt{x}$ find the $f'(3)$

9. $f(x) = 4x - 3x^2$ at $(2, -4)$

10. $f(x) = x^3 - 3x + 1$ at $(2,3)$

11. If a rock is thrown upward on the planet Mars with a velocity of $10\ m/s$, its height (in meters) after t seconds is given by $H = 10t - 1.86t^2$.

   a. Find the velocity of the rock after one second.

   b. Find the velocity of the rock when $t = a$

   c. When will the rock hit the surface?

   d. With what velocity will the rock hit the surface?