201-103-RE - Calculus 1

WORKSHEET: DEFINITION OF THE DERIVATIVE

1. For each function given below, calculate the **derivative at a point** $f'(a)$ using the limit definition.

   (a) $f(x) = 2x^2 - 3x$ $f'(0) =?$

   (b) $f(x) = \sqrt{2x + 1}$ $f'(4) =?$

   (c) $f(x) = \dfrac{1}{x - 2}$ $f'(3) =?$

2. For each function $f(x)$ given below, find the **general derivative** $f'(x)$ as a new function by using the limit definition.

   (a) $f(x) = \sqrt{x - 4}$ $f'(x) =?$

   (b) $f(x) = -x^3$ $f'(x) =?$

   (c) $f(x) = \dfrac{x}{x + 1}$ $f'(x) =?$

   (d) $f(x) = \dfrac{1}{\sqrt{x}}$ $f'(x) =?$

3. For each function $f(x)$ given below, find the **equation of the tangent line** at the indicated point.

   (a) $f(x) = x - x^2$ at $(2, -2)$

   (b) $f(x) = 1 - 3x^2$ at $(0, 1)$

   (c) $f(x) = \dfrac{1}{2x}$ at $x = 1$

   (d) $f(x) = x + \sqrt{x}$ at $x = 1$

ANSWERS:

1. (a) $f'(0) = -3$ (b) $f'(4) = 1/3$ (c) $f'(3) = -1$

2. (a) $f'(x) = \frac{1}{2\sqrt{x-4}}$ (b) $f'(x) = -3x^2$ (c) $f'(x) = \frac{1}{(x+1)^2}$ (d) $f'(x) = \frac{-1}{2x^{3/2}}$

3. (a) $y = -3x + 4$ (b) $y = 1$ (c) $y = -\frac{1}{2}x + 1$ (d) $y = \frac{3}{2}x + \frac{1}{2}$