Definition of the Derivative

1. Using the definition of the derivative find the derivative of the following function and find the derivative at the point given.

$$f(x) = \frac{1}{x+1}, a = -\frac{1}{2}$$

.

Ans. $f'(x) = -\frac{1}{(x+1)^2}, f'(-\frac{1}{2}) = -\frac{4}{9}$

2. Find the tangent line to the following function at the given point

$$f(x) = 3x^2 + 2x - 10, (1, -5)$$

Ans. $y + 5 = 8(x - 1)$.

3. Find the constant a (if it exists) such that the derivative of

$$f(x) = \begin{cases} 2x^2 & x \leq 1 \\ ax - 2 & x > 1 \end{cases}$$

is continuous at $x = 1$.

Ans. $a = 4$