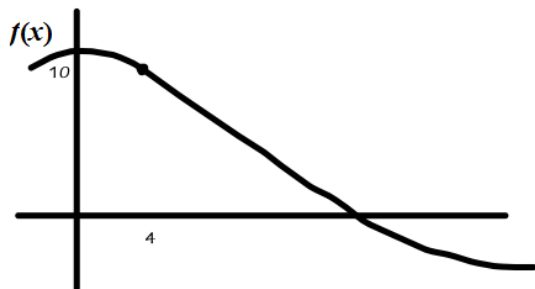


## Special AP topics related to Differentiation

### Linearization and Tangent Line Approximation

**Tangent Line Approximation:** Using the tangent line to approximate a value of a function when the equation of that function is not known (or could be found)



$$f(4) = 10$$
$$f'(4) = -\frac{1}{2}$$

**EX:** Approximate  $f(4.1)$  using the tangent line drawn to  $f(x)$  at  $x = 4$  and determine if this is an overapproximation or underapproximation.

Since the  $y$ -value of the function at  $x = 4.1$  is extremely close to the  $y$ -value of the tangent line at  $x = 4$ , evaluate the equation of the tangent line at  $x = 4.1$ .

**NOTE:** If graph is **concave down** at point of tangency, the estimation is an OVERAPPROXIMATION & If graph is **concave up** at point of tangency, the estimation is an UNDERAPPROXIMATION!

**EX:** Given  $\frac{dy}{dx} = \frac{7}{\sqrt{x^2+7}}$  and  $f(3) = \frac{3}{4}$ , use linear approximation to estimate  $f(2.9)$  and determine if this is an overapproximation or underapproximation.