

Calculus I Quiz 6

Name:

KEY

Pledge:

SHOW ALL WORK. Any answers without work will not receive full credit.

Find the derivatives of the following:

1. $f(x) = 2x^3 - 10x^{-1}$

$$f'(x) = (2(3)x^2 - 10(-1)x^{-2})$$
$$= (6x^2 + 10x^{-2})$$

2. $f(t) = \frac{t}{(t^4 + t^2)(t^7 + 1)}$

$$f'(t) = \frac{(t^4 + t^2)(t^7 + 1)(1) - (t)((t^4 + t^2)(7t^6) + (4t^3 + 2t)(t^7 + 1))}{((t^4 + t^2)(t^7 + 1))^2}$$

OR: $f(t) = \frac{t}{t^{11} + t^9 + t^4 + t^2}$

$$f'(t) = \frac{(t^{11} + t^9 + t^4 + t^2)(1) - (t)(11t^{10} + 9t^8 + 4t^3 + 2t)}{(t^{11} + t^9 + t^4 + t^2)^2}$$

3. Suppose we have $f(4) = 2$, $f'(4) = -3$, $g(4) = 5$, and $g'(4) = -1$.

Calculate $G'(4)$, where $G(x) = (xg(x)f(x))$

$$G'(x) = x(g(x)f'(x) + g'(x)f(x)) + (1)(g(x)f(x))$$

$$G'(4) = 4(g(4)f'(4) + g'(4)f(4)) + (g(4)f(4))$$

$$= 4(5(-3) + (-1)(2)) + (5)(2)$$

$$= 4(-17) + 10$$

$$= -68 + 10 = \boxed{-58}$$

4. What is the velocity of an object dropped from a height of 300 m when it hits the ground? (The formula for its height at time t in seconds is $s(t) = 300 - 4.9t^2$)

when it hits the ground \Leftrightarrow time t when $s(t) = 0$
($s(t)$ is height at time t)

$$300 - 4.9t^2 = 0$$

$$s'(t) = -4.9(2)t$$

$$4.9t^2 = 300$$

$$= -9.8t$$

$$t^2 = \frac{300}{4.9}$$

$$s'\left(\sqrt{\frac{300}{4.9}}\right) = \boxed{-9.8\left(\sqrt{\frac{300}{4.9}}\right) \text{ m/sec}}$$

$$t = \sqrt{\frac{300}{4.9}} \text{ sec.}$$