

**Homework 8 - Math 140**

Name: \_\_\_\_\_

Calculate the following derivatives.

1.  $\frac{d}{dx} \sqrt{x}(x^2 - 4)$

2.  $\frac{d}{dx} \left( \frac{3}{x} - \frac{4}{x^2} \right)$

3.  $\frac{d}{dt} (t-1)(t+1)$

4.  $\frac{d}{dx} \frac{x^4 - 5x^3 + 6x^2}{x^2}$

5.  $\frac{d}{dt} (\sqrt{t})^3$

6.  $\frac{d}{dx} \frac{x^3}{\sqrt{x}}$

7.  $\frac{d}{dx} x^2 e^x$

8.  $\frac{d}{dx} x \ln x$

9. Suppose that  $f(x)$  and  $g(x)$  are functions such that  $f(3) = 5$ ,  $g(3) = 2$  and  $f'(3) = 1$  while  $g'(3) = -2$ .(a) Find the derivative of  $f(x) \cdot g(x)$  when  $x = 3$ .(b) Find the derivative of  $f(x) \cdot f(x)$  when  $x = 3$ .

10. A manufacturer's total monthly revenue is  $R(x) = 240x - 0.05x^2$  where  $x$  is the number of products sold.

(a) Find the marginal revenue  $R'(x)$ .

(b) Calculate  $R'(80)$ .

(c) Calculate  $R(81) - R(80)$ . Is it close to the previous answer? Should it be?

11. Suppose that the total cost to produce  $x$  units is  $C(x) = 3x^2 + x + 500$ .

(a) Find the marginal cost  $C'(x)$ .

(b) Calculate  $C'(40)$ .

12. The average cost per item from the previous problem is  $A(x) = 3x + 1 + \frac{500}{x}$ .

(a) Find the derivative of the average cost function.

(b) Is the average cost increasing or decreasing when the level of production is  $x = 10$ ?