Homework 8 - Math 140

Name: _____

Calculate the following derivatives.

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

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

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

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

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

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

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

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

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 $R'(x)$.

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

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

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

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