

Math 142 Week In Review
Problem Set #6
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Section 4-2

1. Find $f'(x)$ for the following functions.

a) $f(x) = 3e^x + 4\ln(x) - \frac{1}{2}\log_4(x)$

b) $f(x) = 10^x + x^7 + \log(x^7) + 10e^x$

c) $f(x) = \ln\left(\frac{x^2}{5}\right) + \log(2x)$

2. Does the line tangent to the graph of $f(x) = e^x$ at $x = 0.5$ pass through the point $(0.5, 0)$? Explain.

3. A mathematical model for the average of a group of people learning to type is given by $N(t) = 10 + 6\ln(t)$ for $t \geq 1$ where $N(t)$ is the number of words per minute typed after t hours of instruction and practice (2 hours per day, 5 days per week). What is the rate of learning after 15 hours of instruction and practice?

Section 4-3

4. Find $f'(x)$ for the following functions.

a) $f(x) = x^2 \ln(x)$

b) $f(x) = \frac{4e^x}{7x^3 + 2x^2 + 5x}$

c) $f(x) = \frac{\log_3(x^6)}{\sqrt{x} + \sqrt[5]{x^3}}$

d) $f(x) = 5^x \left(\frac{\sqrt{x}}{\sqrt[3]{x^2}} \right)$

5. Suppose that the number x of CD players people are willing to buy per week from a retail chain at a price of $\$p$ is given by

$$x = \frac{4000}{0.1p + 1} \text{ for } 10 \leq p \leq 70.$$

a) Find $\frac{dx}{dp}$

b) Find the demand and the instantaneous rate of change of demand with respect to price when the price is \$40. Write a brief verbal interpretation of these results.

c) Use the results from part (b) to estimate the demand if the price is increased to \$41.

Section 4-4

6. Find $f'(x)$ for the following functions.

a) $f(x) = (5x^4 + 3x^2 + x)^{20}$

b) $f(x) = e^{(\sqrt{x+x^2}-5)}$

c) $f(x) = \log_9(6x^5 + 7x^3 - 5x)$

$$\text{d) } \ln\left(\frac{2x^2 + x}{x+1}\right)$$

$$\text{e) } f(x) = \frac{\log_5(3x^4 + \sqrt{x})}{\sqrt{2x+3}}$$

$$\text{f) } f(x) = \left[\log_2\left(\sqrt{x^2 + e^{3x^2}}\right) \right]^4$$

g) $f(x) = e^{e^{2x}} + x^5 2^{x^2+5x} + e^{\pi^2}$

7. Suppose $F(x) = g(f(x))$ and $f(2) = 3$, $f'(2) = -3$, $g(3) = 5$, and $g'(3) = 4$. Find $F'(2)$.

8. Find the equation of the line tangent to $f(x) = \frac{x^4}{(3x-8)^2}$ at $x = 4$.