

Name: Key

Math 105 Quiz 5 covering §3.1-§3.2 Show all work for credit.

1.  $f(x) = \sqrt{x} \sin(x)$ , find  $f'(x)$ . (Product Rule)

$$f'(x) = \frac{1}{2} x^{-1/2} \sin(x) + \cos(x) \sqrt{x} = \frac{1}{2\sqrt{x}} \sin(x) + \sqrt{x} \cos(x)$$

2. Find  $\frac{d}{dx} \left( \frac{6 - xe^x}{x + e^x} \right)$ . (Product & Quotient Rules)

$$(xe^x)' = e^x + xe^x$$

$$\frac{-(e^x + xe^x)(x + e^x) - (1 + e^x)(6 - xe^x)}{(x + e^x)^2}$$

3. Consider the functions  $f(x)$  and  $g(x)$ , for which  $f(0) = 5$ ,  $g(0) = 7$ ,  $f'(0) = -9$ , and  $g'(0) = -7$ .

Find  $h'(0)$  for the function  $h(x) = \frac{f(x)}{g(x)}$ .  $h'(x) = \frac{f'(x)g(x) - g'(x)f(x)}{g(x)^2}$

$$h'(0) = \frac{f'(0)g(0) - g'(0)f(0)}{g(0)^2} = \frac{(-9 \cdot 7) - (-7)(5)}{(-7)^2} = \frac{-28}{49} = -\frac{4}{7} \approx -.5714$$

4. Let  $f(x) = \sin^4(x)$ . Find  $f'(x)$ . Reminder:  $\sin^4(x) = (\sin(x))^4$

$$f'(x) = 4\sin^3(x) \cdot \cos(x)$$

5. Let  $f(x) = \sin(x^4)$ . Find  $f'(x)$ .

$$f'(x) = \cos(x^4) \cdot 4x^3$$

6.  $g(x) = (12 + e^{2x})^{2/3}$ . Find  $g'(x)$ .

$$g'(x) = \frac{2}{3} (12 + e^{2x})^{-1/3} \cdot (2e^{2x})$$
$$= \frac{2}{3 \sqrt[3]{12 + e^{2x}}} \cdot 2e^{2x} = \frac{4e^{2x}}{3 \sqrt[3]{12 + e^{2x}}}$$