

Name: _____

Homework 4, due on Mon 24 Feb.

Differentiation with the Chain Rule

Find the derivative of each function below. Do not simplify.

1. (2 pts) $f(x) = e^x \sec(e^x)$

$$f'(x) = [e^x] \sec(e^x) + e^x [\sec(e^x) \tan(e^x) \cdot e^x]$$

2. (2 pts) $f(x) = \sqrt{e^x + \cot(x^2)}$

$$f'(x) = \frac{1}{2} (e^x + \cot(x^2))^{-1/2} [e^x - \csc^2(x^2) \cdot 2x]$$

3. (2 pts) $f(x) = \tan(\sqrt{x^2 + \cos x})$

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

4. (2 pts) $f(x) = \frac{\sin(x^2)}{1 + \cos(x^2)}$

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

$$= \frac{(2x \cos(x^2) + 2x \cos^2(x^2) + 2x \sin^2(x^2))}{\text{denom}} = \frac{2x \cos(x^2) + 2x}{(1 + \cos(x^2))^2}$$

5. (2 pts) $f(x) = e^{\cos(x^2+x)}$

$$f'(x) = [e^{\cos(x^2+x)}] [-\sin(x^2+x)] [2x+1]$$