

Solutions to Diff Cal Test #2 Practice Problems:

1. Use the product rule to differentiate.

$$f(x) = \cot x (x + 4)^{2/3}$$

$$f'(x) = (-\csc^2 x)(x + 4)^{2/3} + (\cot x) \left[ \frac{2}{3}(x + 4)^{-1/3} \right]$$

2. Use the quotient rule to differentiate.

$$f(x) = \frac{2x^3 - 4x^2 + 5x - 9}{5 \sec x}$$

$$f'(x) = \frac{(5 \sec x)(6x^2 - 8x + 5) - (2x^3 - 4x^2 + 5x - 9)(5 \sec x \tan x)}{(5 \sec x)^2}$$

3. Find the derivative of  $f$  with respect to  $x$ .

$$f(x) = 5 \sin^2 \left( \sqrt{3 \csc(7x^2 - 2x)} \right) = 5 \left[ \sin \left( (3 \csc(7x^2 - 2x))^{1/2} \right) \right]^2$$

$$f'(x) = 10 \sin(3 \csc(7x^2 - 2x))^{1/2} \cdot \cos(3 \csc(7x^2 - 2x))^{1/2} \cdot \frac{1}{2} (3 \csc(7x^2 - 2x))^{-1/2} \\ \cdot (-3 \csc(7x^2 - 2x) \cot(7x^2 - 2x)) \cdot (14x - 2)$$

4. Find the derivative of  $f$  with respect to  $x$ .

$$f(x) = -3^x \cot(5x^2 + 4x) = -(3^x) \cot(5x^2 + 4x)$$

$$f'(x) = (-3^x \ln 3)(\cot(5x^2 + 4x)) + (-3^x)(-\csc^2(5x^2 + 4x))(10x + 4)$$

5. Find the derivative of  $f$  with respect to  $x$ .

$$f(x) = \log_2 \cos(5x)$$

$$f'(x) = \frac{(-\sin 5x)(5)}{(\ln 2)(\cos 5x)}$$

6. Find the derivative of  $f$  with respect to  $x$ .

$$f(x) = \arcsin(x^2 - 7x)$$

$$f'(x) = \frac{2x - 7}{\sqrt{1 - (x^2 - 7x)^2}}$$

7. Find the derivative of  $f$  with respect to  $x$ .

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

$$f'(x) = e^{\arctan(2x+5)} \cdot \frac{2}{1 + (2x + 5)^2}$$

8. Find the derivative of  $f$  with respect to  $x$ .

$$f(x) = \operatorname{arccsc} x \ln(\tan(2x))$$

$$f'(x) = \left( \frac{-1}{|x|\sqrt{x^2 - 1}} \right) (\ln(\tan 2x)) + (\operatorname{arccsc} x) \left( \frac{(\sec^2 2x)(2)}{\tan 2x} \right)$$