

## MATH 141 WORKSHEET 6

Show all work for full credit.

1. Water pours into a conical tank of height 10 ft and radius 4 ft at a rate of  $10 \text{ ft}^3/\text{min}$ . How fast is the water level rising when it is 5 ft high? (The volume of a cone is  $V = \frac{1}{3}\pi r^2 h$ .)

2. Find the derivative  $f'(x)$ .

$$f(x) = \sin^{-1}(5x)e^{4x^3-x}$$

3. Find the derivative  $f'(x)$ .

$$f(x) = 3^{x \cot(5x^2)}$$

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4. Find the derivative  $f'(x)$ .

$$f(x) = \cos^{-1}(x^3) + \ln(5x^4 - 3x^2 + 1)$$

5. Find the derivative  $f'(x)$ .

$$f(x) = \sqrt[3]{\csc(x^2) + \ln(8x^4)}$$

6. Find the derivative  $f'(x)$ .

$$f(x) = x^3 \tan^{-1}(2x^5)$$

7. Find the derivative  $f'(x)$ .

$$f(x) = \frac{2^x(x^2 - 9x + 8)}{5x^4 + 1}$$

8. Find the derivative  $f'(x)$  using logarithmic differentiation.

$$f(x) = (\sin x)^{\cos(5x)}$$

9. Evaluate the limit.

$$\lim_{x \rightarrow 0} \frac{x \sin x}{2 - 2 \cos x}$$

10. Evaluate the limit.

$$\lim_{x \rightarrow \frac{\pi}{2}} \frac{1 - \sin x}{1 + \cos(2x)}$$

**This page to be completed after Friday's lecture.**

**11.** Evaluate the limit.

$$\lim_{x \rightarrow \frac{\pi}{2}} \left( x \tan x - \frac{\pi}{2} \sec x \right)$$

**12.** Evaluate the limit.

$$\lim_{x \rightarrow 0} (\cos x)^{1/x^2}$$

**13.** Evaluate the limit.

$$\lim_{x \rightarrow +\infty} (2e^x + x)^{3/x}$$