Review Problems for Exam 3
MATH 1850, Spring 2013

1. Find the derivative of y with respect to x.

$$y = \cos^{-1}(2x^6)$$

2. Find the derivative of y with respect to x.

$$y = \sec^{-1}(5x^2 + 1)$$

3. Find the exact value of the expression.

$$\tan(\cos^{-1}(\frac{\sqrt{3}}{2}))$$

4. Assume that all variables are implicit functions of time t. Find $\frac{dy}{dt}$.

$$x^2 + 4y^2 + 4y = 17; \qquad \frac{dx}{dt} = 6 \text{ when } x = 4 \text{ and } y = -2$$

5. A metal cube dissolves in acid such that an edge decreases by 0.40 mm/min. How fast is the volume of the cube changing when the edge is 8.20 mm?

6. Sand falls from a conveyor belt at a rate of 9 m^3/min onto the top of a conical pile. The height of the pile is always three-eighths of the base diameter. How fast are the height and the radius changing when the pile is 5 m high?

7. Find the linearization $L(x)$ of $f(x) = \cot x$ at $x = \frac{\pi}{4}$.

8. Find the differential of the given function.

$$y = \frac{9}{5x^2 + 1}$$

9. Find dy for $8y^{9/4} + 9xy - 5x = 0$.

10. Find dy.

$$y = 4\ln(3 + x^2)$$

11. Find the absolute maximum and minimum values of the function on the given interval.

$$f(x) = -x^2 + 4, \qquad -3 \le x \le 2$$

12. Find the absolute maximum and minimum values of the function on the given interval.

$$f(x) = \sqrt{-x^2 + 1}, \qquad 0 \le x \le 1$$

13. Find the absolute maximum and minimum values of the function on the given interval.

$$f(x) = \frac{1}{x} + \ln x, \qquad 0.6 \le x \le 5$$

14. Determine all critical points for the following function.

$$f(x) = 2x(8 - x)^3$$

15. Determine all critical points for the following function.

$$f(x) = x^2 + \frac{16}{x}$$

16. Answer the following questions about the function whose **derivative** is

$$f'(x) = x^{-1/5}(x - 3)$$

(a) What are the critical points of f?

(b) On what intervals is f increasing or decreasing?

(c) At what points, if any, does f assume local maximum and minimum values?

17. Find the intervals on which the function $g(x) = x\sqrt{18 - x^2}$ is increasing and decreasing. Identify the function's local extreme values, if any, saying where they are taken on. Which, if any, of the extreme values are absolute?

18. Find the intervals on which the function $f(x) = \dfrac{x^2 - 3}{x - 2}$ is increasing and decreasing. Identify the function's local extreme values, if any, saying where they are taken on. Which, if any, of the extreme values are absolute?

19. Sketch the graph of the given function by determining the first and the second derivatives and relevant points.

$$y = x^3 - 7x^2 - 24x + 8$$

20. Graph the function by determining key features of the curve represented by $y = \dfrac{2x}{\sqrt{x^2 + 2}}$. Identify any asymptotes, local and absolute extreme points and inflection points.

21. Find and graph the coordinates of any local extreme points and inflection points of the function $y = \dfrac{x^2 - 3}{x - 2}$, $x \neq 2$.

22. First use L'Hospital's Rule to evaluate $\lim_{x \to 6} \frac{2x - 12}{5x^2 - 180}$. Then determine the limit using limit laws and commonly know limits.

23. Use L'Hospital's Rule to evaluate $\lim_{t \to 0} \frac{-2 \sin(7t^4)}{-3t}$

24. Find the limit.

$$\lim_{x \to \infty} (1 + 2x)^{11/(2 \ln x)}$$

25. Find the limit.

$$\lim_{x \to 1^+} x^{3/(1-x)}$$