Math 141 Review 2

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

$$f(x) = \sec^3(x^2 + x) + x^3$$

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

$$f(x) = \sqrt[9]{\frac{x+2}{x^2+4}}$$

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

$$f(x) = 4^{\sin x - \cos x}$$

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

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

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

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

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

$$f(x) = e^{\cos^{-1}(7x)}$$

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

$$f(x) = \ln(x \tan^3 x)$$

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

$$f(x) = 3^{x^3+2}(x^5 + 2x^3)^4$$

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

$$f(x) = \frac{1}{\sqrt{\cos^2(5x) + x^2}}$$

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

$$f(x) = \frac{\sin(3x)(x^4 + 2x + 1)}{\tan x}$$

11. Find the *second* derivative $f''(x)$.

$$f(x) = \sin(3x)\cos(5x)$$

12. Find $\frac{dy}{dx}$ if the following equation holds.

$$\cos(xy) + x^3y - 2 = y$$

13. Find $\frac{dy}{dx}$ if the following equation holds.

$$x\tan(xy^2) + y(2x+1)^2 = 4$$

14. A two-piece extension ladder leaning against a wall is collapsing at a rate of 2 ft/sec while the foot of the ladder remains a constant 5 ft from the wall. How fast is the ladder moving down the wall when the ladder is 13 ft long?

15. A car leaves Albuquerque and travels east at 36 mph. One hour later, a second car traveling southwards at a constant speed is 48 miles south of Albuquerque and the distance between them is increasing at a rate of 40 mph. Determine the speed of the second car.

16. Evaluate the limit.

$$\lim_{x\to\infty}(xe^{1/x}-x)$$

17. Evaluate the limit.

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

18. Evaluate the limit.

$$\lim_{x\to 0}(1-5x)^{3/x}$$

19. Identify the critical points of the function and use the first derivative test to classify each as the location a local maximum, local minimum, or neither.

$$f(x) = (2x+1)^2(x-4)^3$$

20. Find where the function is increasing, decreasing, concave up, and concave down.

$$f(x) = \frac{1}{4}x^4 + x^3 - \frac{9}{2}x^2 - 27x + 3$$