MATH 34B QUIZ 1 REVIEW

I. Derivatives

Find $\frac{dy}{dx}$ of the the following functions.

1. $y = 6x^4 - 7x^3 + 2x + \sqrt{2}$
2. $y = \frac{2-x^2}{3x^2+1}$
3. $y = (x^3 + 2x + e^\pi)(3 + x - x^2)$
4. $y = (\frac{x+1}{1-x})^2$
5. $y = \sqrt{\frac{1-2}{3x+2}}$
6. $y = \sin(2x^2 - \ln x)$
7. $y = e^{3x^2} + \sec(3x)$
8. $y = \tan(\cos(-3x^2))$
9. $y = 3^x + \tan(\frac{x^2+1}{e^x})$

Find $\frac{d^2y}{dx^2}$ (the second derivative) of the following functions.

10. $y = 2x(x + 4)^3$
11. $y = \frac{x-1}{(x+1)^2}$

II. Application of derivatives

12. After x weeks, the number of people using a new rapid transit system was approximately $N(x) = 6x^3 + 500x + 8000$.

a) At what rate was the use of the system changing with respect to time after 8 weeks?

b) Is the number of people using the transit system increasing or decreasing during the 8th week?

13. A car is traveling at 88 ft/sec when the driver applies the brakes to avoid hitting a child. After t seconds, the car is $s = 88t - 8t^2$ feet from the point where the brakes were applied.

a) How long does it take for the car to come to a stop?

b) How far does it travel before stopping?

14. Sand is leaking from a bag in such a way that after t seconds, there are

$$S(t) = 50(1 - \frac{t^2}{15})^3$$

pounds of sand left in the bag.

a) How much sand was originally in the bag? At what rate is sand leaking from the bag after 1 second?

b) How long does it take for all the sand to leak from the bag?

c) At what rate is the sand leaking from the bag at the time it empties?

III. Implicit differentiation

Use implicit differentiation to find $\frac{dy}{dx}$.

15. $(2x + 3y)^5 = x + 1$
16. $x^2y - 2xy^3 + 6 = 2x + 2y$
16. $x^2 + 2y^3 = \frac{3}{xy}$
17. $y = \frac{x+y}{x-y}$
18. $\sin(\ln y) = e^{x^2y}$

IV. Related rates

19. The demand for a shirt is $2px - 65p - 4950 = 0$, where x hundreds of shirts are demanded per week when p dollars is the price of a shirt. If the shirt is selling this week at \$30 and the price is increasing at the rate of \$0.20 per week, find the rate if change in the demand.

20. At a certain factory, approximately $q(t) = t^2 + 50t$ units are manufactured during the first t hours of a production run, and the total cost of manufacturing q units is $C(q) = 0.1q2 + 10q + 400$ dollars. Find the rate at which the manufacturing cost is changing with respect to time 2hours after production commences.

21. A sphere with a diameter of 4 inches is shrinking at a rate of 2 cubic inches per minute. How fast in square inches per minute is it's surface area decreasing when the radius is 1 inch?

22. A car traveling north at 60 mph and a truck traveling east at 45 mph leave an intersection at the same time. At what rate is the distance between them changing 2 hours later?