

## Math 1210-1    Review 3

1. Find the following:

(a)  $\int 4x^3 - 2x^2 + 9dx$

(b)  $\int x^{3/4}dx$

(c)  $\int 2 \sin x dx$

(d)  $\int \cos^4 x \sin x dx$

(e)  $\int (5x^2 + 1)\sqrt{5x^3 + 3x - 2}dx$

2. Solve the following differential equations:

(a)  $\frac{dy}{dx} = -y^2x(x^2 + 2)^4$

(b)  $\frac{dy}{dx} = -y^2x(x^2 + 2)^4; y = 1$  when  $x = 0$

3. If the brakes of a car, when fully applied, produce a constant deceleration of 11 feet per second per second, what is the shortest distance in which the car can be braked to a halt from a speed of 60 miles per hour?

4. A ball is thrown upward from the surface of the earth with an initial velocity of 55 feet per second. What is the maximum height that it reaches?

5. Write the following in sigma notation:

(a)  $1 + \frac{1}{2} + \frac{1}{3} + \frac{1}{4} + \dots + \frac{1}{100}$

(b)  $1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \frac{1}{9} - \dots - \frac{1}{21}$

(c)  $1 + 3 + 6 + 9 + 12 + \dots + 24$

(d)  $1 + 4 + 7 + 10 + 13 + \dots + 25$

6. Find the following:

(a)  $\sum_{i=1}^{15} i^2$

(b)  $\sum_{j=5}^{20} 2j - 17$

(c)  $\sum_{k=1}^{m+1} (a_k - a_{k-1})$

(d)  $\sum_{i=1}^{3^9} (i^2 - 2i + 3)$

7. In the song The Twelve Days of Christmas, my true love gave me 1 gift on the first day, 1 + 2 gifts on the second day, 1 + 2 + 3 gifts on the third day, and so on for 12 days.

(a) Find the total number of gifts given in 12 days.

(b) Find a simple formula for  $T_n$ , the total number of gifts given during a Christmas of  $n$  days.

8. Write the specific formula needed to estimate the area under the graph of  $y = 2x + 2$  between  $x = 1$  and  $x = 5$  with  $n$  subintervals and using the right hand endpoints of the subintervals.

9. What is the definition of the definite integral?

10. What is the First Fundamental Theorem of Calculus?

11. What is the Second Fundamental Theorem of Calculus?

12. What is the Mean Value Theorem for Integrals?

13. Using the definition of the definite integral, calculate  $\int_0^2 (x^2 - 3)dx$ .

14. Find the derivative of the following functions:

(a)  $G(x) = \int_2^x 3t^3 - 8t + 2dt$

(b)  $F(x) = \int_1^{x^2} 5t + \cos t dt$

(c)  $H(x) = \int_x^{\pi/2} \tan \theta d\theta$

15. Evaluate each of the following:

(a)  $\int_1^4 \frac{s^4 - 8}{s^2} ds$

(b)  $\int_4^{17} \sqrt{w} dw$

(c)  $\int_1^x t^5 dt$

(d)  $\int x^6 (7x^7 + \pi)^8 \sin [(7x^7 + \pi)^9] dx$

(e)  $\int_1^4 \frac{1}{\sqrt{t}(\sqrt{t} + 1)^3} dt$

16. If the velocity of a particle traveling along a coordinate axis is given by  $v(t) = 3t + 14$ , what is the displacement of the particle from  $t = 1$  second to  $t = 7$  seconds?