

# Week in Review # 12

MATH 142

Drost-Spring 2010

## 6.5 Fundamental Theorem of Calculus

1)  $\int_1^3 (4 - 32x^{-3}) dx$

2)  $\int_0^9 x\sqrt{9-x} dx$

3) Find the **exact value** of  $\int_0^{\sqrt{3}} \frac{x}{4-x^2} dx$

4) The Ringin' Ringtone Company finds their marginal cost is defined by  $C'(x) = 200 - 2x$  where  $x$  is the number of ringtones produced each month. Compute the increase in cost to change the production level from 50 ringtones each month to 100 ringtones per month.

5) a. Write the integral to represent the area below  $f(x)$  and above the  $x$ -axis when

$$f(x) = \begin{cases} 4x + 4, & x < 1 \\ 9 - x^2, & x \geq 1 \end{cases}$$

b. Sketch the graph.

c. Find the area.

## 7.1 Area Between Curves

6) Find the area bounded by the curves  $f(x) = x^2 + 1$  and  $g(x) = -2x + 16$ .

7) Find the area bounded by the curves  $f(x) = x^3 - 7x - 6$  and  $g(x) = 6x + 6$ .

8) Find the area bounded by the curves  $f(x) = e^{-x}$  and  $g(x) = \sqrt{x}$  over the interval  $3 \leq x \leq 5$ .

9) The rate of production of oil from a producing field is described by  $R(t) = \frac{50}{t+20} + 15$ , on the interval from  $0 \leq t \leq 12$  where  $R(t)$  is the rate of production in thousands of barrels per year  $t$  years after pumping begins. Find the area between the graph of  $R$  and the  $t$  axis over the interval  $[3, 10]$ , and interpret the results.

## 7.2 Applications

10) Find the consumers' surplus at a price level of \$12 for the price-demand function  $p = D(x) = 40 - .5x$ .

11) Find the point of equilibrium for the Company XYZ which has a price-demand function of  $p = D(x) = 8 - 1.5x$  and a price-supply function of  $p = x^2 + 1$ .

12) Find the producers' surplus at the equilibrium point for the previous problem.

13) Find the consumers' surplus at the equilibrium point for the previous problem.

14) The rate of change of the income provided by the vending machines on the first floor of Blocker is given by  $f(t) = 2500e^{0.03t}$ , where  $t$  is time in years since the installation of the machine. Find the total income produced the third year.

## Miscellaneous Topics

15)  $\int (ax^3 - bx^2 + \frac{c}{x^2} + \frac{\pi}{x}) dx$

16)  $\int 4t \cdot e^{t^2} dt$

17)  $\int \left( \frac{8x^3 - 12x + 6}{x^2} \right) dx$

18)  $\int (9x + 27) \sqrt{3x^2 + 18x - 6} dx$

19)  $\int (x - 2) \cdot (x + 5)^2 dx$

20)  $\int (x^3 - 2x + 1) \cdot (x^2 + 5x - 2) dx$

21)  $\int_a^b (5 - 16x^{-3}) dx$

22)  $\int_0^a x\sqrt{9-x} dx$

23)  $\int \pi \cdot e^2 dt$

24) Given the  $\int_2^5 f(x) dx = 50$ , and the

$\int_3^5 f(x) dx = 30$ , find the area under the curve  $f(x)$  over the interval  $[2, 3]$ .

25)  $\int xe^{-3x^2} dx$