## DAWSON COLLEGE

## MATHEMATICS DEPARTMENT

## FINAL EXAMINATION

**Calculus II Social Science / Commerce   201-203-DW**

**Instructors: A. Hariton, M. Sohrabi, O. Veres**

**Date: Thursday, May 19, 2011**
**Time: 14:00 - 17:00**

1. **[20 marks] Evaluate the following integrals.**

   **a)** $\int x^2 \sqrt{x-1}\, dx$

   **b)** $\int x^2 \ln(2x)\, dx$

   **c)** $\int \frac{5x^2 - 2x + 9}{(x-1)(x^2+3)}\, dx$

   **d)** $\int \cos 4x (\sin 4x + 3)^5\, dx$

2. **[5 marks] Use the limit definition (Riemann Sums) of the definite integral to evaluate**

$$\int_0^3 (2x^2 - 3x + 7)\, dx.$$

3. **[5 marks] The weekly marginal cost function associated with producing a unit is given by the function**

$$C'(x) = 0.00003x^2 - 0.002x + 10$$

   **where $C'(x)$ is measured in dollars/unit, and $x$ denotes the number of units produced. The weekly fixed cost incurred is $ 542. Find t**

4. [10 marks] For a certain commodity the demand equation is $p = -0.1x^2 - x + 104$ and the supply equation is $p = 0.4x^2 + 80$. The price is set at the equilibrium. Find

   a) Consumers' surplus.

   b) Producers' surplus.

5. [5 marks] Use Simpson's Rule with n

# INFORMATION PAGE

$$\sum_{k=1}^{n} 1 = n$$

$$\sum_{k=1}^{n} k = \frac{n(n + 1)}{2}$$

$$\sum_{k=1}^{n} k^2 = \frac{n(n + 1)(2n + 1)}{6}$$

$$\sum_{k=1}^{n} k^3 = \frac{n^2(n + 1)^2}{4}$$

$$CS = \int_{0}^{\bar{x}} D(x)dx - \bar{p}\bar{x} \qquad PS = \bar{p}\bar{x} - \int_{0}^{\bar{x}} S(x)dx$$

$$\int_{a}^{b} f(x)dx = \frac{x}{2}[f(x_0) + 2f(x_1) + 2f(x_2) + \cdots + 2f(x_{n-1}) + f(x_n)]$$

where $\quad x = \frac{b-a}{n}$

$$\int_{a}^{b} f(x)dx = \frac{x}{3}[f(x_0) + 4f(x_1) + 2f(x_2) + 4f(x_3) + 2f(x_4) + \cdots + 4f(x_{n-1}) + f(x_n)]$$

where $\quad x = \frac{b-a}{n}$ and n is even.

**ANSWERS**

1. **a)** $\frac{2}{7}(x-1)^{\frac{7}{2}} + \frac{4}{5}(x-1)^{\frac{5}{2}} + \frac{2}{3}(x-1)^{\frac{3}{2}}) + C$ **b)** $\frac{1}{3}x^3 \ln(2x) - \frac{1}{9}x^3 + C$

   **c)** $3\ln|x-1| + \ln(x^2+3) + C$ **d)** $\frac{1}{24}(\sin 4x + 3)^6 + C$

2. $\frac{51}{2}$

3. $C(300) = 3722$

4. $\bar{x} = 6$, $\bar{p} = 94.4$, $CS = 32.4$, $PS = 57.6$

5. **14.7772**

6. $\frac{125}{6}$

7. $-1$

8. $-2e^2$

10. $\frac{1}{3}y^3 - y^2 = -\frac{1}{x+1} - \frac{1}{6}$

11. $4 + 6(x-1) + \frac{3}{2}(x-1)^2 + 2(x-1)^3 - \frac{3}{4}(x-1)^4$

12. $\frac{109}{18}$

13. $-\frac{4}{75}$

14. **a)** convergent by the Integral Test **b)** convergent by the Comparison Test

   **c)** divergent by the Test for Divergence.