MATH 116 – Spring 2005
Practice Problems for Exam 2

Problem 1. Compute the following integrals. Check your answers.

(A) $\int (x+1)e^x \, dx$.

(B) $\int \sqrt{x}(\ln x) \, dx$.

(C) $\int x \cos x \, dx$.

Problem 2. Circle the correct answer.

(I) $\int xe^{3x} dx =$

$(A)\ xe^{3x} - \dfrac{1}{3}\int e^{3x}dx$ $\quad (B)\ \dfrac{1}{3}xe^{3x} - \dfrac{1}{3}\int e^{3x}dx$ $\quad (C)\ \dfrac{1}{3}xe^{3x} + \dfrac{1}{3}\int e^{3x}dx$ $\quad (D)\ xe^{3x} + \dfrac{1}{3}\int e^{3x}dx$

(E) None of the above.

(II) $\int xe^{-x}dx = g(x) + \int e^{-x}dx$, where

$(A)\ g(x) = xe^{-x}$ $\quad (B)\ g(x) = e^{-x}$ $\quad (C)\ g(x) = -xe^{-x}$ $\quad (D)\ g(x) = x$ $\quad (E)$ None of the above.

(III) $\int_0^\infty e^{-x}dx =$

$(A)\ \infty \quad (B)\ e \quad (C)\ 1 \quad (D)\ 0 \quad (E)$ None of the above.

(IV) The approximation of $\int_0^1 e^{-x^2} dx$ given by the trapezoidal rule with $n = 3$ is approximated equal to:

$(A)\ \dfrac{e}{3} \quad (B)\ 0.97 \quad (C)\ 0.74 \quad (D)\ 2.9 \quad (E)$ None of the above.

Problem 3. Find the area enclosed by the given curves.

(A) The graph of $f(x) = x^3$ and the graph of $g(x) = x^{1/3}$.

(B) The graph of $f(x) = x^2 - 2x$ and the x–axis for $0 \le x \le 6$. Is this the same as

$$\int_0^6 (x^2 - 2x) \, dx \ ? \quad \text{Why?}$$

Problem 4. A company estimates that the rate of increase of the profits from a new product is given by $(t+1)^{-4/3}$ (in millions of dollars per year), where t is in years. If this rate continues forever, what will be the eventual profits?

Problem 5. The population of a new town at time t is given by $P(t) = 10,000 \ln(t)$ people, where $t \ge 1$ is measured in years from the time the town was created. What is the average population over the period of time from $t = 1$ to $t = e$.

Problem 6. The velocity of a boat is given by $v(t) = -0.1\,t^2 + 2\,t + 44$ feet per second for $0 \le t \le 20$ and t measured in seconds. Find the distance traveled by the boat during that 20-second period.

Problem 7. Problem 32 (a) p.521.