King Fahd University of Petroleum & Minerals
Department of Mathematics and Statistics

Math 102 - Semester 063

First Major (90 Minutes) **17/7/2007**

Name: **ID #:** **Section:**

Part 1: **Provide neat, complete and detailed solutions.**

Q1. (10 Points) Find the area enclosed by the curves of $y^2 - 2 = x$ and $2y = x - 1$.

Q2. (30 Points) Find the volume of the solid obtained by rotating the region in the first quadrant enclosed by the curves $y = \sqrt{x}$, the x-axis and the line $x = 4$:

1. about the x-axis

2. about the line $x = 6$

<u>Part 2</u>: (60 Points) Circle the correct answer in each of the following:

1. $\int \frac{3x}{x^2+1} dx =$

   (a) $\tan^{-1}(x) + C$
   (b) $\frac{1}{3}\tan^{-1}(x) + C$
   (c) $\ln(x^2+1) + C$
   (d) $\frac{3}{2}\ln(x^2+1) + C$
   (e) $\ln|3x| + C$

2. $\int_{-2}^{0}(2+\sqrt{4-x^2})dx =$

   (a) $\pi + 1$
   (b) $\pi + 4$
   (c) π
   (d) $\frac{\pi}{2}$
   (e) $\pi - 2$

3. Let $I = \int_{-2}^{3} xe^{-x}dx$. Then, we can say

   (a) $-10e^2 \leq I \leq \frac{5}{e}$
   (b) $-10e^2 \leq I \leq -8e^2$
   (c) $\frac{3}{e^3} \leq I \leq \frac{1}{e}$
   (d) $0 \leq I \leq 1$
   (e) $I \geq \frac{5}{e}$

4. $\frac{d}{dx}\int_{x^2}^{x^3}(t^2+1)dx =$

   (a) $x^6 - x^2$
   (b) $x^3 - x^2$
   (c) 0
   (d) $3x^2 - 2x$
   (e) $3x^8 - 2x^5 + 3x^2 - 2x$

5. If $\int_1^3 f(x)dx = \int_3^5 -2f(x)dx = \int_1^3 (g(x)+2)dx = \int_3^5 (g(x)+x)dx = 3$, then $\int_1^5 (f(x)-g(x))dx =$

   (a) 6
   (b) $-\frac{9}{2}$
   (c) -9
   (d) $\frac{15}{2}$
   (e) $-\frac{1}{2}$

6. $\int_0^{\frac{\pi}{4}} \frac{\sin(2x)}{\sqrt{1-\cos(2x)}} dx =$

   (a) 2π
   (b) $\frac{1}{2}$
   (c) -2
   (d) 2
   (e) 1

7. $\int_{-2}^{3} |x+1|\, dx =$

   (a) $\frac{17}{2}$
   (b) $\frac{1}{2}$
   (c) 8
   (d) $-\frac{17}{2}$
   (e) 17

8. $\lim_{n\mapsto\infty}(\frac{1}{n^3}\sum_{i=1}^{n}(i^2) =$

   (a) $\int_0^2 x^2dx$

   (b) $\int_0^2 \frac{x^2}{8}dx$

   (c) $\int_0^1 2x^2dx$

   (d) $\int_0^2 xdx$

   (e) $\int_0^2 2x^3dx$

9. $\int_{-\frac{\pi}{4}}^{\frac{\pi}{4}} \tan(x)dx =$

   (a) 1

   (b) $\frac{\sqrt{2}}{2}$

   (c) $\sqrt{2}$

   (d) 0

   (e) -1

10. If a particle is moving along a straight line and its velocity is given by

$$v(t) = t^2 - 5t + 4,\ 0 \leq t \leq 4,$$

then its displacement and distance it travels on the time interval $[0, 4]$ are:

   (a) displacement $= -\frac{8}{3}$, distance $= \frac{8}{3}$

   (b) displacement $= \frac{8}{3}$, distance $= \frac{8}{3}$

   (c) displacement $= -\frac{8}{3}$, distance $= \frac{19}{3}$

   (d) displacement $= \frac{8}{3}$, distance $= \frac{19}{3}$

   (e) displacement $= 0$, distance $= \frac{19}{3}$