King Fahd University of Petroleum and Minerals
Department of Mathematics and Statistics
Math 102 – Semester 063

Second Major (<u>120 Minutes</u>) **7/8/2007**

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

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

Q1. **(15 points)** Find the area of the surface of revolution formed by rotating the arc $x = 4 - y^2$ from $x = 2$ to $x = 4$ about the x-axis.

Q2. **(25 points)** Find $\displaystyle\int \frac{1}{x^4 - x^3 - x + 1}\, dx.$

Part 2: **(60 points)**

1. $\displaystyle\int_0^{\pi/2} \cos^3(x)dx =$

   (a) $\frac{1}{4}$

   (b) 0

   (c) $\frac{2}{3}$

   (d) $-\frac{2}{3}$

   (e) $-\frac{1}{4}$

2. $\displaystyle\int \cos(3x)\cos(2x)\, dx =$

   (a) $\sin(3x)\sin(2x) + c$

   (b) $\frac{1}{6}\sin(3x)\sin(2x) + c$

   (c) $\frac{\sin(5x)}{5} + c$

   (d) $\frac{1}{2}\sin(x) + \frac{1}{10}\sin(5x) + c$

   (e) $\frac{1}{3}\sin(3x) + \frac{1}{4}\sin(2x) + c$

3. The improper integral $\int_e^\infty \frac{1}{x\ln(x)}\,dx$

(a) converges to 1

(b) converges to 2

(c) converges to π

(d) converges to $\frac{1}{2}$

(e) diverges

4. $\int \tan^6(x)dx =$

(a) $\frac{\tan^5(x)}{5} - \frac{\tan^3(x)}{3} + \tan(x) - x + c$

(b) $\frac{\tan^7(x)}{7} + c$

(c) $\frac{\tan^5(x)}{5} + \frac{\tan^3(x)}{3} + \tan(x) + x + c$

(d) $\ln|\sec^6(x)| + c$

(e) $\sec^6(x) + c$

5. $\int_0^{\pi} x^2 \cos(x) dx =$

(a) $-\pi$

(b) 0

(c) π

(d) 2π

(e) -2π

6. $\int_0^{\pi/2} \frac{1}{1+\sin(x)+\cos(x)} \, dx =$

(a) 0

(b) 2

(c) $2 \ln 2$

(d) $\ln 2$

(e) $-\ln 2$

7. $\displaystyle\int_0^3 \frac{dx}{(x-1)^2} =$

(a) $-\dfrac{3}{2}$

(b) $\dfrac{3}{2}$

(c) does not exist

(d) $-\dfrac{2}{3}$

(e) 0

8. The length of the arc defined by $y = x^{2/3}$ from $(1, 1)$ to $(8, 4)$ equals

(a) $\dfrac{80\sqrt{10} + 13\sqrt{13}}{27}$

(b) $\dfrac{80\sqrt{10} - 13\sqrt{13}}{27}$

(c) $80\sqrt{10} - 13\sqrt{13}$

(d) $\dfrac{80\sqrt{10} + 13\sqrt{13}}{9}$

(e) $\dfrac{-80\sqrt{10} - 13\sqrt{13}}{27}$

9. The average value of $f(x) = \dfrac{1}{1-\cos x}$ on $\left[\dfrac{\pi}{4}, \dfrac{\pi}{3}\right]$ equals

(a) $\dfrac{12(1+\sqrt{2}-\sqrt{3})}{\pi}$

(b) $\dfrac{12(1-\sqrt{2}+\sqrt{3})}{\pi}$

(c) $\dfrac{12(1-\sqrt{2}-\sqrt{3})}{\pi}$

(d) $\dfrac{\pi(1+\sqrt{2}-\sqrt{3})}{12}$

(e) $12\pi(1+\sqrt{2}-\sqrt{3})$

10. $\displaystyle\int \frac{dx}{x^2+2x+10}$ equals

(a) $\dfrac{1}{3}\arcsin\dfrac{x+1}{3}+c$

(b) $\arctan(x+1)+c$

(c) $\dfrac{1}{3}\arctan\dfrac{x+1}{3}+c$

(d) $\arctan\dfrac{x+1}{3}+c$

(e) $\dfrac{1}{3}\arctan(x+1)+c$