MATH 22 PRACTICE EXAM ON SURFACE AREA

Name:

Section:

Instructions:

(1) Books, notes, and calculators are not permitted.
(2) Simplify as instructed. On some problems, unsimplified correct answers will not receive full credit.
(3) Show your work as instructed. On some problems, correct answers without justification will not receive full credit.

(1)

(2)

(3)

(4)

(5)

Total

Problem 1. (5 pts.) Circle the correct answer. There will be no partial credit. You do not need to show your work.

Which of the following is the area of the surface obtained by rotating the line segment $y = x - 1$, $1 \leq x \leq 2$ about the y-axis?

A. $\pi\sqrt{2}$.

B. $2\pi\sqrt{2}$.

C. $3\pi\sqrt{2}$.

D. $4\pi\sqrt{2}$.

E. None of these.

Problem 2. (5 pts.) Circle the correct answer. There will be no partial credit. You do not need to show your work.

Which of the following integrals gives the area of the surface obtained by rotating the parabolic arc $y = x^2$, $0 \leq x \leq 4$ about the x-axis?

A. $\dfrac{\pi}{4}\displaystyle\int_0^{\arctan 2} \tan^2\theta \sec^3\theta \, d\theta.$

B. $\dfrac{\pi}{4}\displaystyle\int_0^{\arctan 4} \tan^2\theta \sec^3\theta \, d\theta.$

C. $\dfrac{\pi}{4}\displaystyle\int_0^{\arctan 2} \tan^2\theta \sec^4\theta \, d\theta.$

D. $\dfrac{\pi}{4}\displaystyle\int_0^{\arctan 4} \tan^2\theta \sec^4\theta \, d\theta.$

E. None of these.

Problem 3. (5 pts.) Circle the correct answer. There will be no partial credit. You do not need to show your work.

Which of the following is the area of the surface obtained by rotating the arc $y = x^3$, $0 \leq x \leq 2$ about the x-axis?

A. $\frac{2\pi}{3}$.

B. $\frac{\pi}{18}(11)$.

C. $\frac{\pi}{27}(12^3 - 1)$.

D. $\frac{\pi}{27}(145^{3/2} - 1)$.

E. None of these.

Problem 4. (5 pts.) Circle the correct answer. There will be no partial credit. You do not need to show your work.

Which of the following integrals gives the area of the surface obtained by rotating the parabolic arc $y = \sqrt{x}$, $1 \leq x \leq 4$ about the line $y = -1$?

A. $2\pi \displaystyle\int_1^4 ((\sqrt{x} + 1)\sqrt{1 + (4x)^{-1}}\, dx.$

B. $2\pi \displaystyle\int_1^2 ((\sqrt{x} + 1)\sqrt{1 + (4x)^{-1}}\, dx.$

C. $2\pi \displaystyle\int_1^4 ((\sqrt{x} - 1)\sqrt{1 + (4x)^{-1}}\, dx.$

D. $2\pi \displaystyle\int_1^2 ((\sqrt{x} - 1)\sqrt{1 + (4x)^{-1}}\, dx.$

E. None of these.

Problem 5. (15 pts.) (a) Set up, but do not evaluate an integral which gives the area of the surface obtained by rotating the arc $y = x^4$, $-1 \leq x \leq 1$ about the line $y = -2$.

(b) Use Simpson's rule with 2 parabolas ($n = 4$) to approximate the integral you set up in part (a).

Problem 6. (15 pts.) (a) Set up, but do not evaluate, an integral which gives the area of the surface obtained by rotating the arc $y = e^x$, $-3 \leq x \leq 1$ about the y-axis.

(b) Use the midpoint rule with 4 rectangles to approximate the integral you set up in part (a). Check your work with a calculator.

Problem 7. (15 pts.) (a) Set up but do not evaluate an integral which gives the area of the surface obtained by rotating the arc $y = \cos x$ from $x = 0$ to $x = 2\pi$ about the y-axis.

(b) Use Simpson's rule, with four parabolas ($n = 8$) to estimate the integral in part (a). Show your work and simplify your answer.