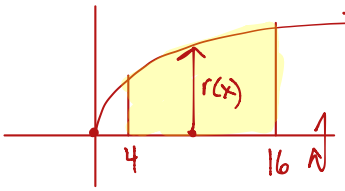
Name KEY Date Period

Worksheet 10.5—Surface Area
Show all work on a separate sheet of paper. Calculator on #1 only.

Free Response & Short Answer

$$\text{Area} = 2\pi \int_a^b r(x)\sqrt{1+[f'(x)]^2}\,dx$$

1. (Calculator Permitted—Show your set up) Find the area of the surface obtained by rotating the curve $y=\sqrt{x}$ about the x-axis on the interval $4 \le x \le 16$.



$y' = \frac{1}{2}x^{-1/2}$

$y' = \frac{1}{2\sqrt{x}}$

$$\text{Area} = 2\pi \int_4^{16} \sqrt{x}\sqrt{1+\left(\frac{1}{2\sqrt{x}}\right)^2}\,dx$$

$$= 2\pi \int_4^{16} \sqrt{x}\sqrt{1+\frac{1}{4x}}\,dx$$

$$= 237.689$$

Multiple Choice

2. (No Calculator—Show your work) The area of the surface of revolution formed by revolving the graph of $f(x)=x+1$ from $0 \le x \le 1$ about the x-axis is which of the following?

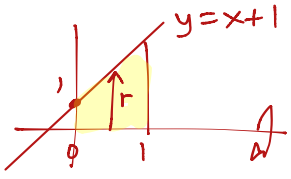
(A) $\frac{3\sqrt{2}}{2}\pi$

(B) $3\sqrt{2}\pi$

(C) $2\sqrt{2}\pi$

(D) $3\sqrt{5}\pi$

(E) $2\sqrt{5}\pi$



$y' = 1$

$$\text{Area} = 2\pi \int_0^1 (x+1)\sqrt{1+1^2}\,dx$$

$$= 2\pi \cdot \sqrt{2}\left[\frac{1}{2}x^2 + x\right]\Big|_0^1$$

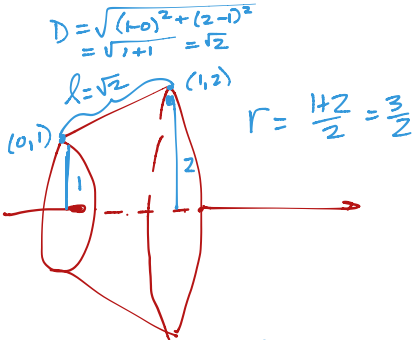
$$= 2\sqrt{2}\pi\left[\left(\frac{1}{2}+1\right)-(0+0)\right]$$

$$= 2\sqrt{2}\pi\left(\frac{3}{2}\right)$$

$$= 3\sqrt{2}\pi$$

OR

$D = \sqrt{(1-0)^2+(2-1)^2} = \sqrt{1+1} = \sqrt{2}$



$r = \frac{1+2}{2} = \frac{3}{2}$

$$\text{Area} = 2\pi r l$$

$$= 2\pi\left(\frac{3}{2}\right)\sqrt{2}$$

$$= 3\sqrt{2}\pi$$