Math 2414 Quiz February 8, 2017 Unsupported answers earn NO credit

Problem 1 (10 points) Name and Section Number

Problem 2 (20 points) SET UP the integral(s) to find the arc length of the following curve:

$$f(x) = x^3 e^x \qquad x \in [0, 3]$$

$f'(x) = x^3 e^x + 3x^2 e^x$

Continuous everywhere

$$\int_0^3 \sqrt{1 + (x^3 e^x + 3x^2 e^x)^2}\, dx$$

Problem 3 (40 points) FIND the surface area when the following function is revolved about the y-axis.

$$f(t) = \frac{t^2}{4} \qquad t \in [2, 4]$$

$y = \frac{t^2}{4}$

$\boxed{\frac{dt}{dy} = \frac{1}{\sqrt{y}} \text{ continuous on } [1,4]}$

$2\sqrt{y} = t$

$$2\pi \int_1^4 2\sqrt{y} \sqrt{1 + \left(\frac{1}{\sqrt{y}}\right)^2}\, dy$$

$$2\pi \int_1^4 2\sqrt{y} \sqrt{1 + \frac{1}{y}}\, dy$$

$$4\pi \int_1^4 \sqrt{y+1}\, dy$$

$$\left.\frac{4\pi (y+1)^{3/2}}{3/2}\right|_1^4$$

$$\boxed{\frac{8\pi}{3}(5)^{3/2} - \frac{8\pi}{3}(2)^{3/2}}$$

Problem 4 (40 points) FIND the total surface area (so including the base!) when R (given below) is revolved about the y-axis.

$f(x) = \sin(x), y = 0, \quad x \in [0, \pi]$

base is circle of radius π, so $\pi(\pi^2) = \pi^3$ units

$y = \sin(x)$

$\sin^{-1}(y) = x$

$y \in [0, 1]$

$$2\pi \int_0^1 \cancel{\sin^{-1}(y)} \sqrt{1 + \left(\frac{1}{\sqrt{1-y^2}}\right)^2}\, dy$$

also not continuous at $y = 1$

$$\boxed{2\pi \int_0^1 \sin^{-1}(y) \sqrt{\frac{2-y^2}{1-y^2}}\, dy}$$

Cannot actuall evaluate based on what we have covered in class.