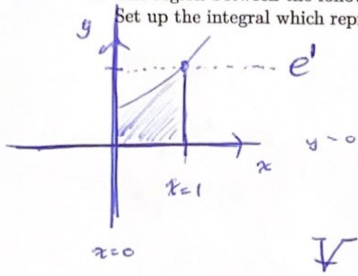
Quiz 2
MATH 112-017 and 112-019
New Jersey Inst. Tech.
Prof. Nicholas Dubicki
Time Limit: 15 min.

Name: Answer and Rubric

Date: ______

Section: ______

1. The region between the following curves: $y = 0$, $y = e^x$, $x = 0$, and $x = 1$ is revolved around the x-axis. Set up the integral which represents the volume of the resultant solid. ~~(You need not solve the integral).~~ solve the integral $\boxed{\cancel{5}}$ $\boxed{4}$



use disk method

$R(x) = e^x - 0$ — (1)

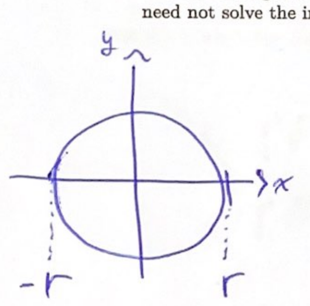
bounds: $x \in [0, 1]$ — (1)

$$V = \pi \int_0^1 R(x)^2\, dx$$ — (1)

$$V = \pi \int_0^1 e^{2x}\, dx = \pi\left[\tfrac{1}{2}e^{2x}\right]\Big|_{x=0}^{1}$$ — (1)

$$= \frac{\pi}{2}(e^2 - e^0) = \frac{\pi}{2}(e^2 - 1)$$

2. Use the arclength integral to express the circumference of a circle centered at the origin of radius r. (You need not solve the integral). HINT: the equation for a circle is not necessarily a strict function $y(x)$ $\boxed{\cancel{5}}$ $\boxed{6}$



$r^2 = x^2 + y^2$: eqtn for a circle

$y = \pm\sqrt{r^2 - x^2}$ — (1)

take positive root, this represents the upper arc. — (1)

$$L = \int_{-r}^{r} \sqrt{1 + \left(\frac{dy}{dx}\right)^2}\, dx$$ — (1)

the circumference is therefore $\boxed{C = 2L}$ — (1)

(1) — $$\frac{dy}{dx} = \frac{-2x}{2\sqrt{r^2 - x^2}}$$

$$\left(\frac{dy}{dx}\right)^2 = \frac{x^2}{r^2 - x^2}$$

$$C = 2\int_{-r}^{r} \sqrt{1 + \frac{x^2}{r^2 - x^2}}\, dx$$

this is done — (1)

also acceptable is

$$C = 2\int_{-r}^{r} \sqrt{\frac{r^2}{r^2 - x^2}}\, dx$$