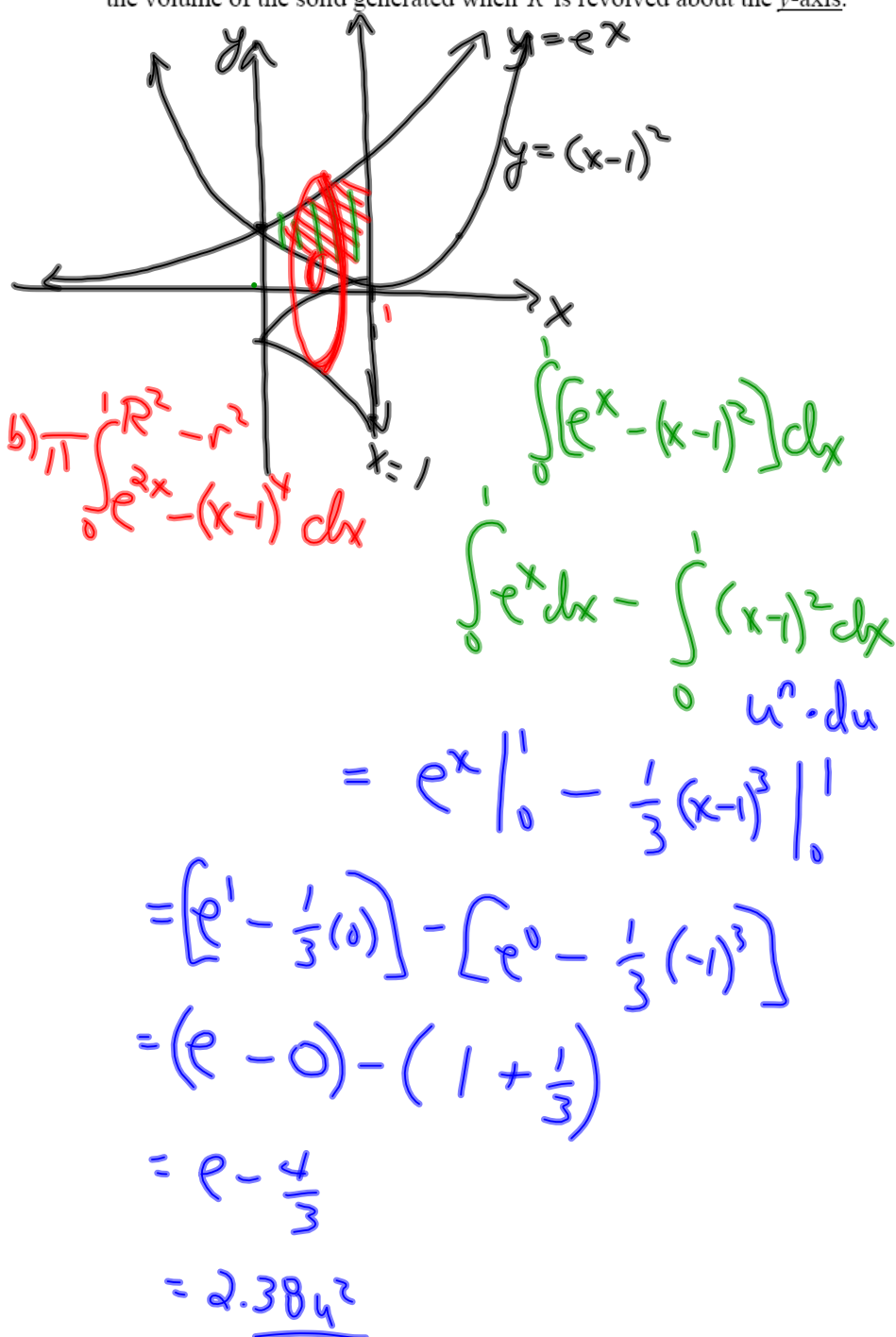


# Warm Up

1990 AB3

Let  $R$  be the region enclosed by the graphs of  $y = e^x$ ,  $y = (x-1)^2$ , and the line  $x = 1$ .

- ✓ (a) Find the area of  $R$ .
- ✓ (b) Find the volume of the solid generated when  $R$  is revolved about the  $x$ -axis.
- (c) Set up, but do not integrate, an integral expression in terms of a single variable for the volume of the solid generated when  $R$  is revolved about the  $y$ -axis.



$$b) \pi \int_0^1 R^2 - r^2 dx$$

$$= \pi \int_0^1 e^{2x} - (x-1)^4 dx$$

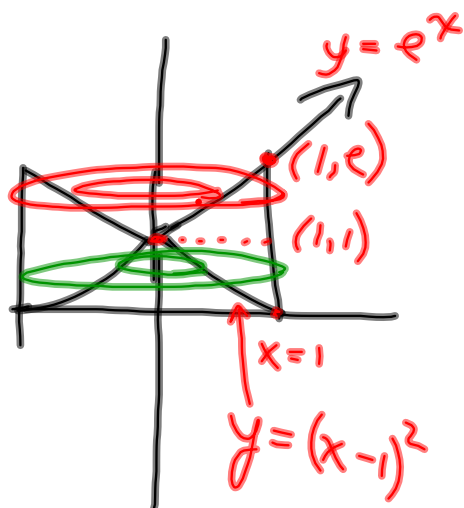
$$\pi \left( \frac{1}{2} e^{2x} - \frac{1}{5} (x-1)^5 \right) \Big|_0^1$$

$$\pi \left( \frac{1}{2} e^2 - 0 \right) - \left( \frac{1}{2} - \frac{1}{5} (4) \right)$$

$$= \left( \frac{e^2}{2} - \frac{1}{2} + \frac{4}{5} \right) \pi$$

$$= \underline{10.7 u^3} \text{ or } = \frac{5e^2 - 5 - 2}{10} = \underline{\frac{5e^2 - 7}{10} u^3}$$

c)



$$y = e^x$$

$$\ln y = \ln e^x$$

$$\ln y = x$$

$$\sqrt{y} = \sqrt{(x-1)^2}$$

$$\pm \sqrt{y} = (x-1)$$

$$x = 1 \pm \sqrt{y}$$

WASHER METHOD

$$\pi \int_0^1 (1)^2 - (1 - \sqrt{y})^2 dy + \pi \int_1^e (1)^2 - (\ln y)^2 dy$$

OR

SHELL METHOD

$$2\pi \int_0^1 [e^x - (x-1)^2] dx$$