πr^2 $\quad R = 2 - e^{-x}$

$r = 1 - e^{-x}$

1\. A

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

B. $\cancel{\text{RERERY}}$ $\quad -\ln y = x$

$$\pi \int_0^1 (2 - (-\ln y))^2 \, dy$$

C.

$$2\pi \int_0^2 (x+2)(1-e^{-x}) \, dx$$

2\.

$$f(x) = \frac{2}{3}x^{3/2} - \frac{1}{2}x^{1/2} \quad [1,9]$$

$$f'(x) = x^{1/2} - \frac{1}{4\sqrt{x}}$$

$$f'(x)^2 = \left(x - \frac{1}{2} + \frac{1}{16x}\right)$$

$$= \int_1^9 \left(\sqrt{x + \frac{1}{2} + \frac{1}{16x}}\right) dx$$

$$= \int_1^9 \sqrt{\left(x^{1/2} + \frac{1}{4\sqrt{x}}\right)^2} \, dx = \int_1^9 \left(x^{1/2} + \frac{x^{-1/2}}{4}\right) dx$$

$$= \frac{2x^{\frac{3}{2}}}{3} + \frac{\sqrt{x}}{8} \Bigg|_1^9 \left(9 + \frac{3}{8}\right) - \left(\frac{2}{3} + \frac{1}{8}\right)$$

$$\left(\frac{72}{8} + \frac{3}{8}\right) - \left(\frac{18}{24} + \frac{3}{24}\right)$$

$$\frac{75}{8} - \frac{21}{24} = \frac{204}{24} \boxed{= \frac{17}{2}}$$

25

$(5-2x)(5-2x)$

$25-10x-10x+4x^2$

$4x^2-20x+25$

3. $f(x)=\sqrt{-x^2+5x}$

$=(-x^2+5x)^{1/2}$

$f'(x)=\frac{1}{2}(-x^2+5x)^{-\frac{1}{2}}\cdot(-2x+5)$

$f'(x)=\frac{(-2x+5)}{2(-x^2+5x)^{1/2}}$

$=\frac{5-2x}{2(5x-x^2)^{1/2}}$ $\quad f'(x)^2=\left(\frac{5-2x}{2(5x-x^2)^{1/2}}\right)^2=\frac{4x^2-20x+25}{20x-4x^2}$

$2\pi\int_1^4\sqrt{-x^2+5x}\cdot\sqrt{1+\left(\frac{4x^2-20x+25}{20x-4x^2}\right)}\,dx$

$=2\pi\int_1^4\sqrt{(-x^2+5x)\left(1+\frac{4x^2-20x+25}{20x-4x^2}\right)}\,dx$

$=2\pi\int_1^4\sqrt{-x^2+5x)\left(1+\frac{4x^2-20x+25}{4(-x^2+5x)}\right.}\,dx$

$=2\pi\int_1^4\sqrt{-x^2+5x+\frac{4x^2-20x+25}{4}}\,dx$

$2\pi\int_1^4\sqrt{\frac{-4x^2+20x}{4}+\frac{4x^2-20x+25}{4}}$

$2\pi\int_1^4\sqrt{\frac{25}{4}}\,dx=2\pi\int_1^4\frac{9}{2}\,dx=2\pi\left(\frac{9}{2}x\right)\Big|_1^4$ $\quad 2\pi\left(18-\frac{9}{2}\right)$

$=2\pi\left(\frac{27}{2}\right)$

$\boxed{=27\pi}$

4. 2J of work for .1 How much for .4

$2 = .1F \quad F = 20$

$20 = k(.1)$

$k = 200 \quad F(x) = 200x$

$W = \int_0^{.4} (200x)\,dx = 100x^2 \Big|_0^{.4} \quad 16 - 0 = \boxed{16\ J}$