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# ASSIGNMENT

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Subj: Numerical Methods for Engineers.

Slot: H

**Soln. 1** · total vol. of the pit $= \int_{h=0}^{3} \pi r^2 \, dh$

Simpson's 1/3rd Rule $\qquad h = 0.5$

$$\int_a^b f(x)\,dx = \frac{h}{3}\left[(y_0 + y_n) + 4(y_1 + y_3 + y_5 + \cdots + y_{n-1}) + 2(y_2 + y_4 + \cdots + y_{n-2})\right]$$

$$= \pi \cdot \frac{(0.5)}{3}\left[(0^2 + 11^2) + 4\left((0.75)^2 + (3.75)^2 + (8.5)^2\right) + 2(2.46^2)\right]$$

$$= \pi \cdot \frac{0.5}{3}\left[896\right] = 448 \times \frac{22}{7} = 448 \times 1.046$$

$$= 468.87$$

Sol 2 Total time taken $T = \int_{14}^{10} dt = \frac{1}{48} \int_{10}^{14} \frac{A}{\sqrt{h}} dh$

Trapezoidal rule $= \int_a^b f(x) \cdot dx = \frac{h}{2}[(y_0 + y_n) + 2(y_1 + y_2 \cdots + y_{n-1})$

$f_0 = \frac{950}{\sqrt{10}}$, $f_1 = \frac{1070}{\sqrt{11}}$, $f_2 = \frac{1200}{\sqrt{12}}$, $f_3 = \frac{1350}{\sqrt{13}}$, $f_4 = \frac{1530}{\sqrt{14}}$

$f_0 = 300.41$, $f_1 = 322.61$, $f_2 = 346.41$, $f_3 = 374.42$, $f_4 = 408.90$

So $A_{rea} = \frac{1}{48} \cdot \frac{h}{2}[(f_0 + f_4) + 2(f_1 + f_2 + f_3)]$

$h = \frac{b-a}{n} = \frac{14-10}{4} = 1$

$$\text{Area} = \frac{1}{48} \cdot \frac{1}{2} \left[ (300.41 + 408.90) + 2(322.61 + 346.41 + 374.42) \right]$$

$$= \frac{2796.19}{48 \times 2} = \frac{2796.19}{96} = 29.1269$$

Simpson's $1/3^{rd}$ Rule.

$$\text{Area} = \frac{1}{48} \cdot \frac{1}{3} \left[ (f_0 + f_4) + 4(f_1 + f_3) + 2(f_2) \right]$$

$$= \frac{1}{48 \times 3} \left[ (300.41 + 408.90) + 4(322.61 + 374.42) + 2(346.41) \right]$$

$$= \frac{4190.25}{48 \times 3} = \frac{4190.25}{144}$$

$$= 29.0989$$

Solution 3 distance $s(t) = \int v(t)\,dt$

Trapezoidal Rule $= \int_a^b f(x)\,dx = \frac{h}{2}\left[(y_0 + y_n) + 2(y_1 + y_2 + y_3 \cdots y_{n-1})\right]$

$$s(t) = \int_{100}^{700} v(t)\,dt$$

$$= \frac{100}{2}\left[(62 + 66) + 2(66 + 68 + 68 + 71 + 68)\right]$$

$$= 50 \times 810$$

$$= 40500 \text{ km}$$

Solution 5 $vol = \int_0^1 \pi y^2$

Using Simpson's 1/3 rd rule

$$= \pi \cdot \frac{(0.25)}{3} [(1^2 + (0.8415)^2] + 4[(0.9896)^2 + (0.9089)^2] + 2.[0.9589^2])$$

$$= \pi \cdot \frac{(0.25)}{3} [10.7697]$$

$$= \frac{\pi}{3} [2.6922]$$

$$= 1.0466 \times 2.6922$$

$$= 2.8178$$