

ESP
Kouba
Worksheet 1 solutions

1.) a.) $\sum_{i=1}^4 \frac{i^3}{i^2+7} = \frac{1}{8} + \frac{8}{11} + \frac{27}{16} + \frac{64}{23} \approx 5.322$

b.) $\sum_{i=6}^{10} (7-i) = 1 + 0 + (-1) + (-2) + (-3) = -5$

c.) $\sum_{i=1}^{1000} 3i = 3 \sum_{i=1}^{1000} i = 3 \cdot \frac{1000(1000+1)}{2} = 1,501,500$

d.) $\sum_{i=1}^{500} 7 = 500 \cdot 7 = 3500$

e.) $\sum_{i=126}^{500} 7 = 375 \cdot 7 = 2625$

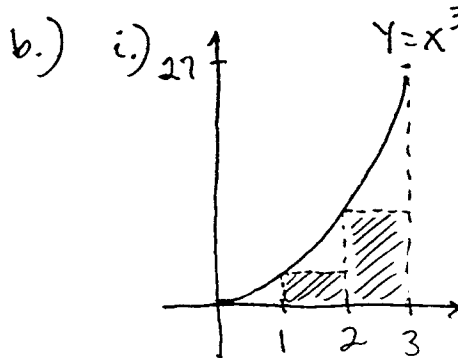
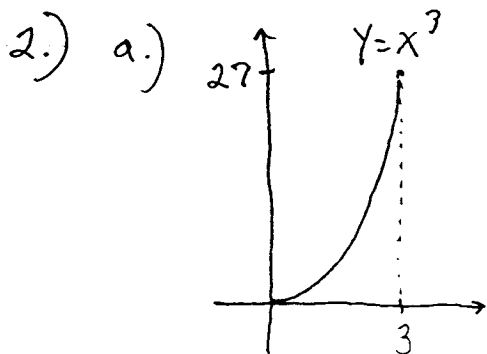
f.) $\sum_{i=1}^{300} (5+i)^2 = \sum_{i=1}^{300} (25 + 10i + i^2)$

$= \sum_{i=1}^{300} 25 + 10 \sum_{i=1}^{300} i + \sum_{i=1}^{300} i^2$

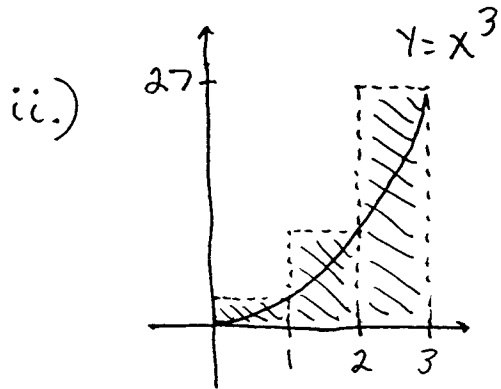
$= 300 \cdot 25 + 10 \cdot \frac{300(300+1)}{2} + \frac{300(300+1)(600+1)}{6}$

$= 9,504,050$

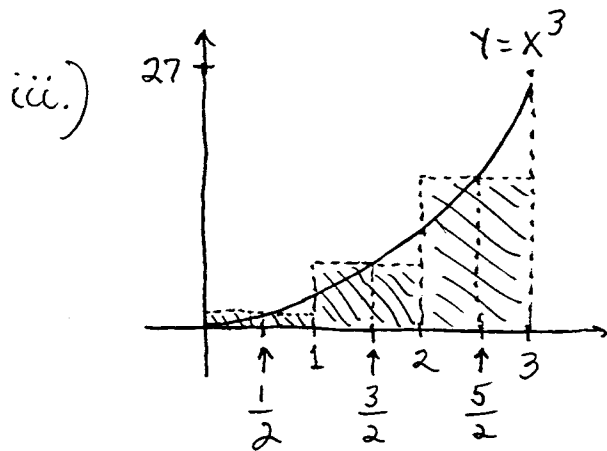
g.) $\sum_{i=7}^{2000} \left[\frac{1}{i+1} - \frac{1}{i} \right] = \left(\frac{1}{8} - \frac{1}{7} \right) + \left(\frac{1}{9} - \frac{1}{8} \right) + \left(\frac{1}{10} - \frac{1}{9} \right) + \left(\frac{1}{11} - \frac{1}{10} \right) + \dots + \left(\frac{1}{2000} - \frac{1}{1999} \right) + \left(\frac{1}{2001} - \frac{1}{2000} \right) = \frac{1}{2001} - \frac{1}{7} \approx -.1424$



Area $\approx 0^3(1)$
 $+ 1^3(1) + 2^3(1)$
 $= 9$

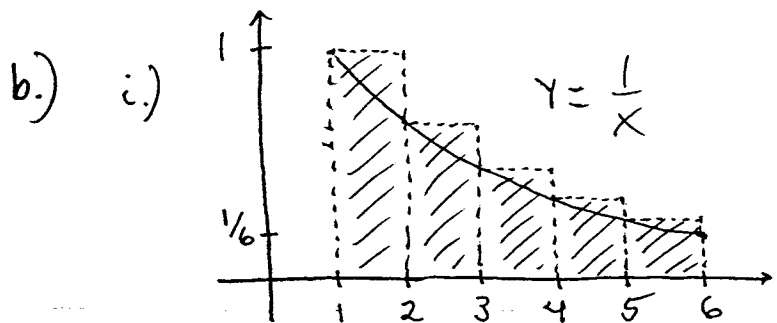
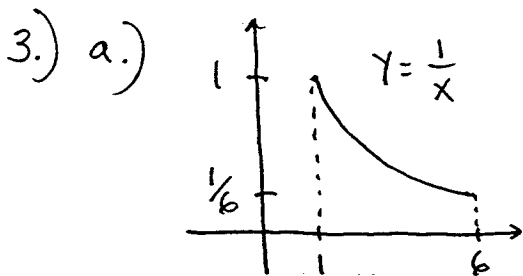


$$\text{Area} \approx 1^3(1) + 2^3(1) + 3^3(1) = 36$$

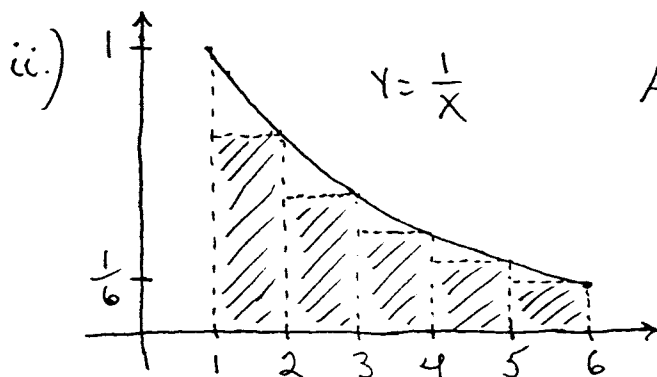


$$\text{Area} \approx \left(\frac{1}{2}\right)^3 \cdot 1 + \left(\frac{3}{2}\right)^3 \cdot 1 + \left(\frac{5}{2}\right)^3 \cdot 1 = \frac{153}{8}$$

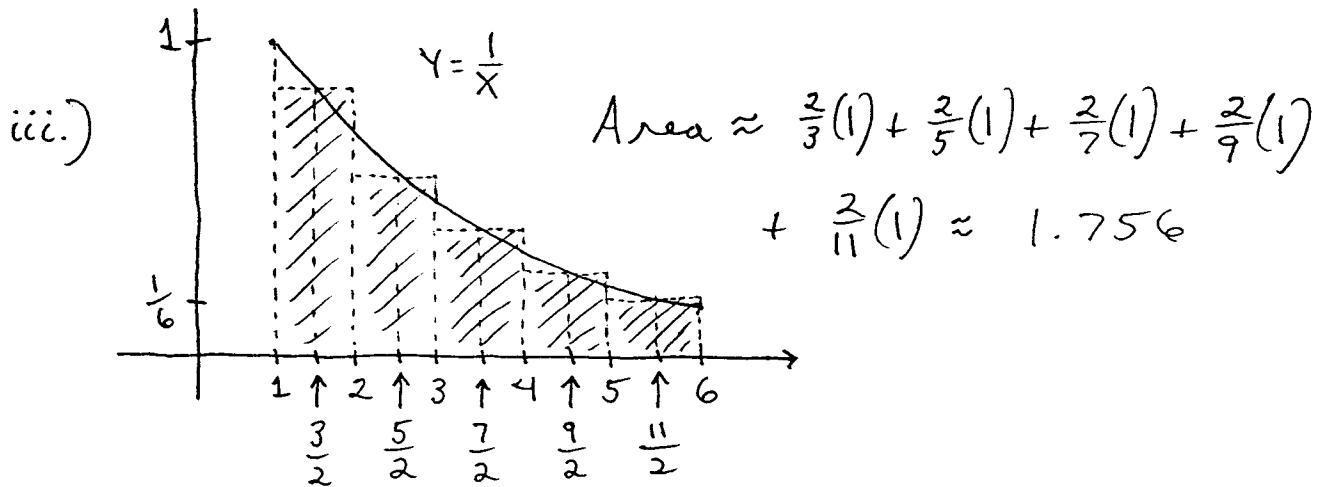
c.) Part iii.) is probably best.



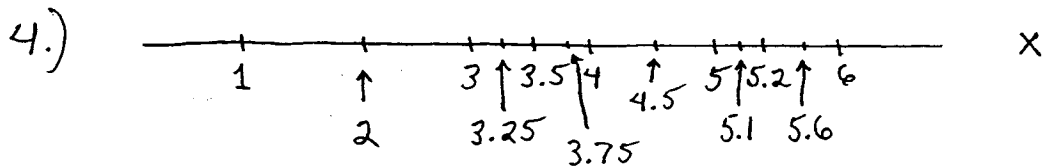
$$\text{Area} \approx 1 \cdot (1) + \frac{1}{2}(1) + \frac{1}{3}(1) + \frac{1}{4}(1) + \frac{1}{5}(1) = \frac{137}{60}$$



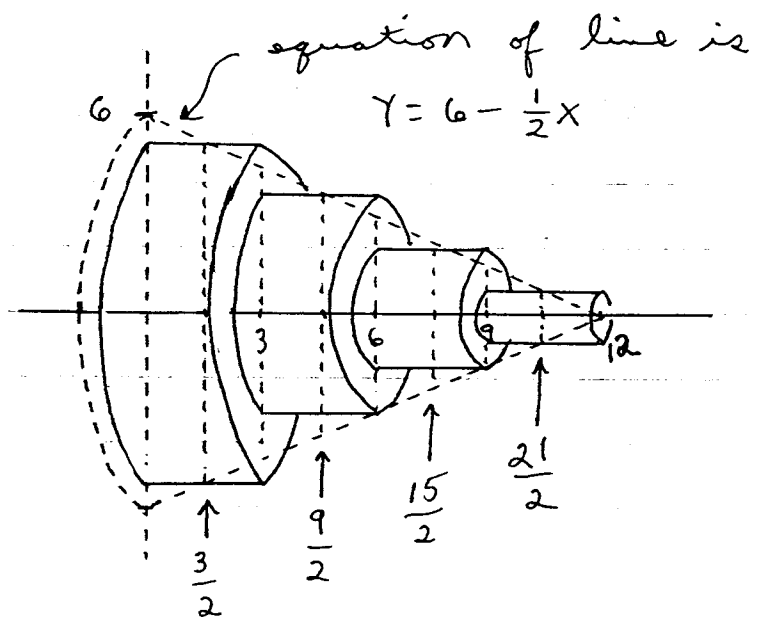
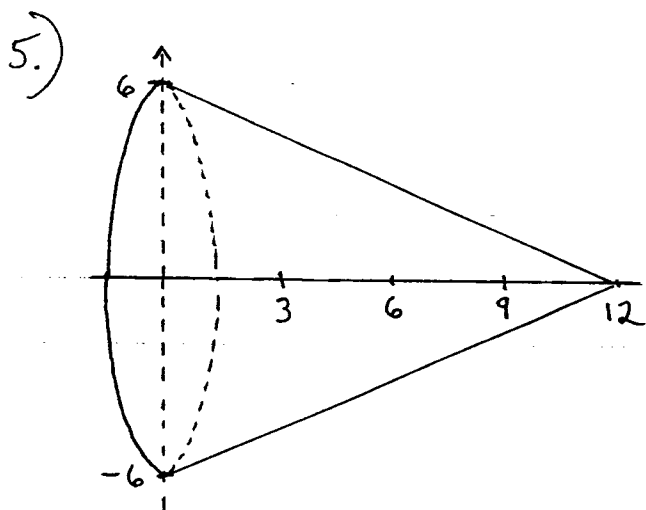
$$\text{Area} \approx \frac{1}{2}(1) + \frac{1}{3}(1) + \frac{1}{4}(1) + \frac{1}{5}(1) + \frac{1}{6}(1) = \frac{87}{60}$$



e.) Part iii.) is probably best.



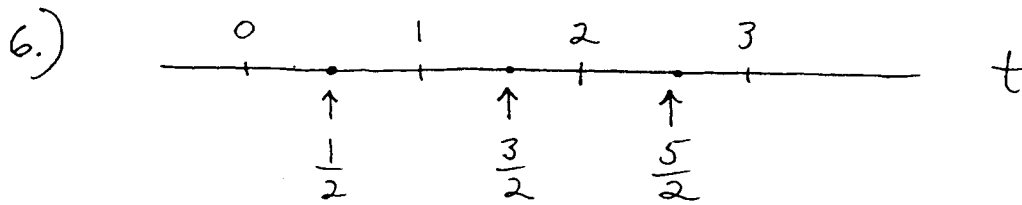
$$\text{Area} \approx \frac{1}{2}(2) + \frac{1}{3.25}(.5) + \frac{1}{3.75}(.5) + \frac{1}{4.5}(1) + \frac{1}{5.1}(.2) + \frac{1}{5.6}(.8) \approx 1.691$$



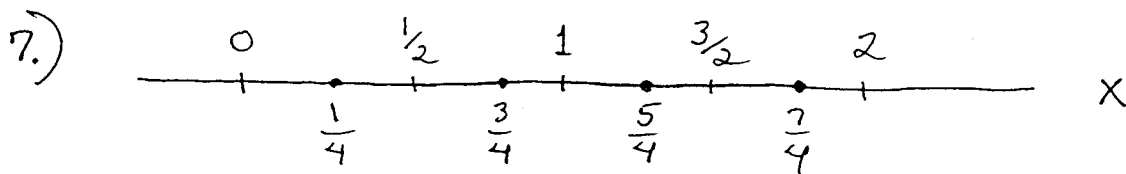
$$\text{Volume} \approx \pi \left(\frac{21}{4}\right)^2 \cdot 3 + \pi \left(\frac{15}{4}\right)^2 \cdot 3 + \pi \left(\frac{9}{4}\right)^2 \cdot 3 + \pi \left(\frac{3}{4}\right)^2 \cdot 3$$

$$\approx 445.32 \text{ cm}^3$$

$$\text{Distance} = \text{Speed} \times \text{Time}$$



$$\text{Total Distance} \approx \left(\frac{1}{2}\right)^3 \cdot 1 + \left(\frac{3}{2}\right)^3 \cdot 1 + \left(\frac{5}{2}\right)^3 \cdot 1 = \frac{153}{8} \text{ miles}$$



$$\text{Mass} = \text{Density} \times \text{Length}$$

$$\text{Total Mass} \approx \left(\left(\frac{1}{4}\right)^2 + 1\right) \cdot \frac{1}{2} + \left(\left(\frac{3}{4}\right)^2 + 1\right) \cdot \frac{1}{2}$$

$$+ \left(\left(\frac{5}{4}\right)^2 + 1\right) \cdot \frac{1}{2} + \left(\left(\frac{7}{4}\right)^2 + 1\right) \cdot \frac{1}{2} = \frac{37}{8} \text{ gm.}$$