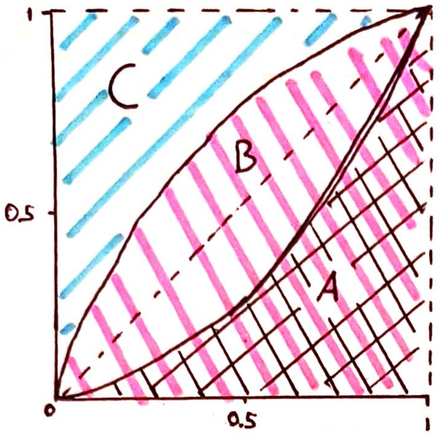
1.)



The curve $y=x^2$ reflected along $y=x$ (between $x=0,1$) is equal to the curve $y=\sqrt{x}$.

from this we know that $y=\sqrt{x}$ is the inverse of $y=x^2$.

Because $y=x^2$ is ~~symetricat~~ equal to the curve $y=\sqrt{x}$ when reflected along $y=x$:

$C = A$ and $C + B = 1$.

Therefor:

$A + B = 1$

2.) a.) $a = 3.9$ $\qquad v = \int a \, dt$ $\qquad s = \int v \, dt$

$v = \int a \, dt = 3.9t$ $\quad$ ($+c = 0$, initial $v = 0$)

$s = \int v \, dt = \frac{3.9t^2}{2}$ $\quad$ ($+c = 0$, initial $s = 0$)

$s = \left[\frac{3.9t^2}{2}\right]_0^{20} = \frac{3.9 \times 20^2}{2} = 780\text{m}$

b.) $v = \left[3.9t\right]_0^{20} = 3.9 \times 20 = 78\text{ms}^{-1}$

c.) initial $v = 12.0\text{ms}^{-1}$

$v = 3.9t + 12$

$s = \int v \, dt = \frac{3.9t^2}{2} + 12t$ (equate to 780 $\cancel{1220}$)

$\frac{3.9t^2}{2} + 12t = \cancel{0}780$ $\quad t = 17.15$

$V = 3.9 \times 17.15 + 12 = 78.89 \text{ ms}^{-1}$

3.)

$a = 23.6 \ ms^{-2}$

a.)

$v = \int a \ dt \qquad v = 23.6t$

at what value of t is velocity 12

$23.6t = 12$

$t = 0.51$ seconds

$s = \int v \ dt \qquad s = \frac{23.6t^2}{2}$

b.) what value of displacement when $t = 0.51$

$$s = \frac{23.6 \times 0.51^2}{2} = 3.05 m$$

The height should be 3.05m

4.)

a.) $v(t) = e^{-2t}$

$$s(t) = \int v(t) \ dt = -\frac{1}{2}e^{-2t} + c$$

$$[s(t)]_1^2 = \left[-\frac{1}{2}e^{-2t}\right]_1^2 = \left(-\frac{1}{2}e^{-4}\right) - \left(-\frac{1}{2}e^{-2}\right)$$

$$[s(t)]_1^2 = 0.059 \ m$$

$$[s(t)]_2^3 = \left[-\frac{1}{2}e^{-2t}\right]_2^3 = \left(-\frac{1}{2}e^{-6}\right) - \left(-\frac{1}{2}e^{-4}\right)$$

$$[s(t)]_2^3 = 7.92 \times 10^{-3}$$

b.)

$$v(t) = \frac{t}{2} - 3t^2$$

$$s(t) = \frac{t^2}{4} - t^3 + c$$

$$[s(t)]_1^2 = \left[\frac{t^2}{4} - t^3\right]_1^2 = \left(\frac{4}{4} - 8\right) - \left(\frac{1}{4} - 1\right)$$

$$[s(t)]_1^2 = -6.25$$

$$[s(t)]_2^3 = \left[\frac{t^2}{4} - t^3\right]_2^3 = \left(\frac{9}{4} - 27\right) - (1 - 8)$$

$$[s(t)]_2^3 = -17.75$$

c.) $v(t) = 2t - e^t$

$s(t) = \int 2t - e^t \, dt = t^2 - e^t + c$

$[s(t)]_1^2 = [t^2 - e^t]_1^2 = (4 - e^2) - (1 - e^1)$

$[s(t)]_1^2 = -1.67$

$[s(t)]_2^3 = [t^2 - e^t]_2^3 = (27 - e^3) - (4 - e^2)$

$[s(t)]_2^3 = 10.30$

5.) $v(t) = \pi \sin\left(\frac{\pi t}{4}\right)$

$s(t) = \pi \int \sin\left(\frac{\pi t}{4}\right) = -4\pi \frac{\cos\left(\frac{\pi t}{4}\right)}{\pi} + C$

b.) sub in $t = 0$ ~~as~~ and $s(t) = 0$

$-4\pi \frac{\cos(0)}{\pi} + C = 0 \quad \therefore C = 4$

c.) $-4\pi \frac{\cos\left(\frac{2\pi}{4}\right)}{\pi} + 4 = 4$

d.) $-4\pi \frac{\cos\left(\frac{4\pi}{4}\right)}{4} + 4 = 8$

e.) The diameter of the wheel is 8m

6.) a.) $\int [\sin(3x - 1) - x] \, dx = \frac{-\cos(3x-1)}{3} - \frac{x^2}{2} + C$

b.) $\int \cos^2(4x) \, dx = \frac{1}{2} \int 1 + \cos(8x)$

$= \frac{1}{2}\left(x + \frac{\sin(8x)}{8}\right) + C$