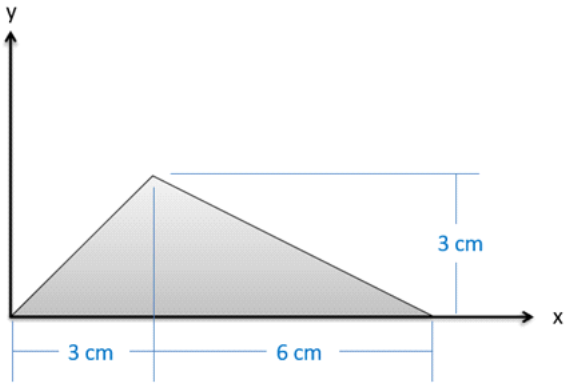
Question 2

Find the x and y coordinates of the centroid of the shape shown below.



$$\bar{x} = \frac{\int_0^3 (dA_1)(x) + \int_3^9 (dA_2)(x)}{\text{Area}} = \frac{\int_0^3 (x)\,dx(x) + \int_3^9 \left(-\frac{1}{2}x + \frac{9}{2}\right)dx(x)}{\frac{1}{2}(9)(3)}$$

$$\bar{x} = \frac{\left|_0^3 \left(\frac{1}{3}x^3\right) + \right|_3^9 \left(-\frac{1}{6}x^3 + \frac{9}{4}x^2\right)}{13.5}$$

$$\bar{x} = \frac{\left(\frac{1}{3}(3)^3 - (0)\right) + \left(\left(-\frac{1}{6}(9)^3 + \frac{9}{4}(9)^2\right) - \left(-\frac{1}{6}(3)^3 + \frac{9}{4}(3)^2\right)\right)}{13.5} = 4\,\text{cm}$$

$$\bar{y} = \frac{\int_0^3 (dA)(y)}{\text{Area}} = \frac{\int_0^3 (-3y + 9)\,dy(y)}{13.5}$$

$$\bar{y} = \frac{\left|_0^3 \left(-y^3 + \frac{9}{2}y^2\right)\right.}{13.5} = \frac{\left(-3(3)^3 + \frac{9}{2}(3)^2\right) - (0)}{13.5} = 1\,\text{cm}$$

Centroid at $(4, 1)$ cm