

<5.1~5.5 >

$$5.2 \quad A = \frac{1}{2}(60 \text{ mm})(75 \text{ mm}) = 2250 \text{ mm}^2$$

$$\bar{x} = \frac{2}{3}(60 \text{ mm}) = 40 \text{ mm}$$

$$\bar{y} = \frac{1}{3}(75 \text{ mm}) = 25 \text{ mm}$$

$$A = (105 \text{ mm})(75 \text{ mm}) = 7875 \text{ mm}^2$$

$$\bar{x} = (60 \text{ mm}) + \frac{1}{2}(105 \text{ mm}) = 112.5 \text{ mm}$$

$$\bar{y} = \frac{1}{2}(75 \text{ mm}) = 37.5 \text{ mm}$$

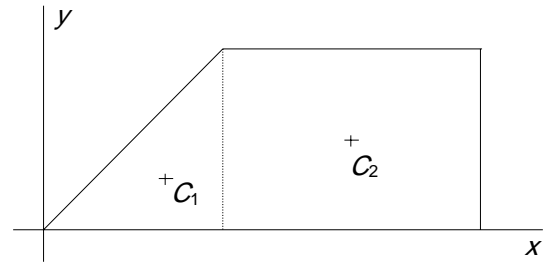
$$A = 2250 + 7875 \text{ (mm}^2\text{)} = 10,125 \text{ mm}^2$$

$$(\bar{x}A) = (40 \text{ mm})(2250 \text{ mm}^2) + (112.5 \text{ mm})(7875 \text{ mm}^2) = 975,937 \text{ mm}^3$$

$$(\bar{y}A) = (25 \text{ mm})(2250 \text{ mm}^2) + (37.5 \text{ mm})(7875 \text{ mm}^2) = 351,562 \text{ mm}^3$$

$$\bar{X} = \frac{\Sigma(\bar{x}A)}{\Sigma A} = \frac{975.937 \times 10^3 \text{ mm}^3}{10.125 \times 10^3 \text{ mm}^2} = 96.4 \text{ mm}$$

$$\bar{Y} = \frac{\Sigma(\bar{y}A)}{\Sigma A} = \frac{351.562 \times 10^3 \text{ mm}^3}{10.125 \times 10^3 \text{ mm}^2} = 34.7 \text{ mm}$$



$$5.5 \quad A = (120 \text{ mm})(200 \text{ mm}) = 24,000 \text{ mm}^2$$

$$\bar{x} = \frac{1}{2}(120 \text{ mm}) = 60 \text{ mm}$$

$$\bar{y} = \frac{1}{2}(200 \text{ mm}) = 100 \text{ mm}$$

$$A = -\frac{1}{2}\pi(60 \text{ mm})^2 = -5,654 \text{ mm}^2$$

$$\bar{x} = (120 \text{ mm}) - \frac{4}{3\pi}(60 \text{ mm}) = 94.5 \text{ mm}$$

$$\bar{y} = 120 \text{ mm}$$

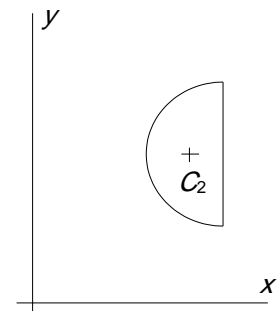
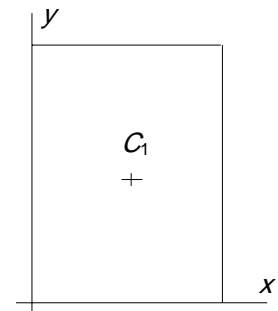
$$A = 24,000 + (-5,654) \text{ (mm}^2\text{)} = 18,346 \text{ mm}^2$$

$$(\bar{x}A) = (60 \text{ mm})(24,000 \text{ mm}^2) + (94.5 \text{ mm})(-5,654 \text{ mm}^2) = 905,697 \text{ mm}^3$$

$$(\bar{y}A) = (100 \text{ mm})(24,000 \text{ mm}^2) + (120 \text{ mm})(-5,654 \text{ mm}^2) = 1,721,520 \text{ mm}^3$$

$$\bar{X} = \frac{\Sigma(\bar{x}A)}{\Sigma A} = \frac{905.697 \times 10^3 \text{ mm}^3}{18.346 \times 10^3 \text{ mm}^2} = 49.4 \text{ mm}$$

$$\bar{Y} = \frac{\Sigma(\bar{y}A)}{\Sigma A} = \frac{1721.520 \times 10^3 \text{ mm}^3}{18.346 \times 10^3 \text{ mm}^2} = 93.8 \text{ mm}$$



5.26

$$M_B = 0$$

$$\bar{X} = 0$$

$$(\bar{x}L) = 0$$

$$L = \pi (150 \text{ mm})$$

$$\bar{x} = -\frac{2}{\pi}(150 \text{ mm}) = -\frac{1}{\pi}(300 \text{ mm})$$

$$L = 200 \text{ mm}$$

$$\bar{x} = \frac{1}{2}(200 \text{ mm}) = 100 \text{ mm}$$

$$L = 150 \text{ mm}$$

$$\bar{x} = (200 \text{ mm}) - \frac{1}{2}(150 \text{ mm}) \cos \theta = 200 - 75 \cos \theta \quad (\text{mm})$$

$$(\bar{x}L) = -\frac{1}{\pi}(300 \text{ mm}) \pi (150 \text{ mm}) + (100 \text{ mm})(200 \text{ mm})$$

$$+ [200 - 75 \cos \theta \quad (\text{mm})](150 \text{ mm}) = 0$$

$$\cos \theta = \frac{1}{75} [-(300 \text{ mm}) + (100 \text{ mm})(200 \text{ mm}) \frac{1}{150 \text{ mm}} + (200 \text{ mm})]$$

$$= 0.4444$$

$$\theta = \cos^{-1} 0.4444 = 63.6^\circ$$

