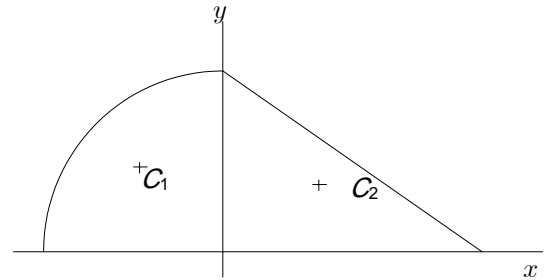


<5.1~5.5 >

5.6 $A = \frac{1}{4}\pi(225 \text{ mm})^2 = 39761 \text{ mm}^2$
 $\bar{x} = -\frac{4}{3\pi}(225 \text{ mm}) = -95.49 \text{ mm}$
 $\bar{y} = 95.49 \text{ mm}$
 $A = \frac{1}{2}(375 \text{ mm})(225 \text{ mm}) = 42188 \text{ mm}^2$
 $\bar{x} = \frac{1}{3}(375 \text{ mm}) = 125 \text{ mm}$
 $\bar{y} = \frac{1}{3}(225 \text{ mm}) = 75 \text{ mm}$



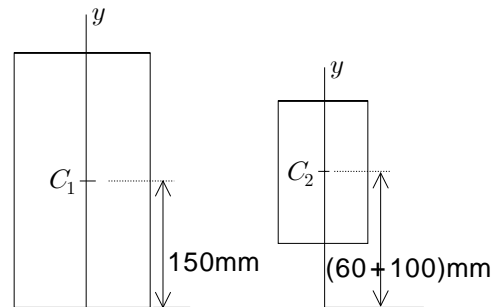
$A = 39761 + 42188 \text{ (mm}^2\text{)} = 81949 \text{ mm}^2$
 $(\bar{x}A) = (-95.49 \text{ mm})(39761 \text{ mm}^2) + (125 \text{ mm})(42188 \text{ mm}^2) = 1,476,722 \text{ mm}^3$
 $(\bar{y}A) = (95.49 \text{ mm})(39761 \text{ mm}^2) + (75 \text{ mm})(42188 \text{ mm}^2) = 6,960,878 \text{ mm}^3$

$\bar{X} = \frac{\Sigma(\bar{x}A)}{\Sigma A} = \frac{1476.722 \times 10^3 \text{ mm}^3}{81.949 \times 10^3 \text{ mm}^2} = 18.02 \text{ mm}$

$\bar{Y} = \frac{\Sigma(\bar{y}A)}{\Sigma A} = \frac{6960.878 \times 10^3 \text{ mm}^3}{81.949 \times 10^3 \text{ mm}^2} = 84.9 \text{ mm}$

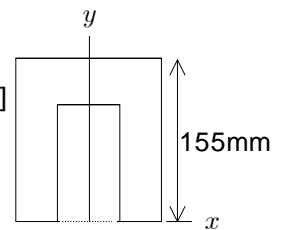
centroid = (18.02 mm, 84.9 mm) ()

5.18 $A = (160 \text{ mm})(300 \text{ mm}) = 48,000 \text{ mm}^2$
 $\bar{y} = \frac{1}{2}(300 \text{ mm}) = 150 \text{ mm}$
 $A = -(80 \text{ mm})(200 \text{ mm}) = -16,000 \text{ mm}^2$
 $\bar{y} = (60 \text{ mm}) + \frac{1}{2}(200 \text{ mm}) = 160 \text{ mm}$
 $A = 48,000 + (-16,000) \text{ (mm}^2\text{)} = 32,000 \text{ mm}^2$
 $(\bar{y}A) = (150 \text{ mm})(48,000 \text{ mm}^2) + (160 \text{ mm})(-16,000 \text{ mm}^2)$
 $= 4,640,000 \text{ mm}^3$



$\bar{Y} = \frac{\Sigma(\bar{y}A)}{\Sigma A} = \frac{4640 \times 10^3 \text{ mm}^3}{32.00 \times 10^3 \text{ mm}^2} = 145.0 \text{ mm}$

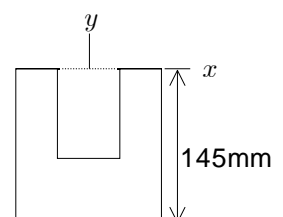
$Q_I = (\bar{y}A) = \frac{155}{2}(160 \text{ mm})(155 \text{ mm}) + \frac{115}{2}[-(80 \text{ mm})(115 \text{ mm})]$
 $= 1,393,000 \text{ mm}^3$



$Q_{II} = (\bar{y}A) = \frac{145}{2}(160 \text{ mm})(145 \text{ mm}) + \frac{85}{2}[-(80 \text{ mm})(85 \text{ mm})]$
 $= -1,393,000 \text{ mm}^3$

$Q = Q_I + Q_{II} = 0$

$x \quad \bar{y} = 0 \quad . \quad Q_x = \bar{y} A = 0 \quad .$



5.28

$$M_C = 0$$

$$\bar{X} = 0$$

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

$$L = ?$$

$$\bar{x} = \frac{L}{2}$$

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

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

$$L = 250 \text{ mm}$$

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

$$(\bar{x}L) = \frac{L}{2}L + (-100 \text{ mm})(200 \text{ mm}) + (100 \text{ mm})(250 \text{ mm}) = 0$$

$$L^2 = 2 [(100 \text{ mm})(200 \text{ mm}) + (100 \text{ mm})(250 \text{ mm})] = 90,000 \text{ mm}^2$$

$$L = 300 \text{ mm}$$

