

Start here for

Question Number: **3**

$$(a) \text{ i. } M = \left( \frac{12-2}{2}, \frac{6-4}{2} \right)$$

$$= (5, 1)$$

$$\text{ii. } m_{BC} = \frac{y_2 - y_1}{x_2 - x_1}$$

$$= \frac{8-6}{6-12}$$

$$= \frac{2}{-6}$$

$$= -\frac{1}{3}$$

iii. In  $\triangle ABC$  &  $\triangle AMN$   
 $\angle A$  is common  
 ~~$\angle AMN = \angle ABC$  (corresponding angles)~~  
 ~~$\angle ANM = \angle ACB$  (corresponding angles)~~  
 ~~$\triangle ABC \sim \triangle AMN$~~

$$d_{AM} = \sqrt{(-4-1)^2 + (-2-5)^2}$$

$$= \sqrt{25 + 49}$$

$$= \sqrt{74}$$

$$\begin{aligned} \text{iii. } d_{AB} &= \sqrt{(-4-6)^2 + (-2-12)^2} \\ &= \sqrt{100 + 196} \\ &= \sqrt{296} \end{aligned}$$

$$\begin{aligned} d_{AN} &= \sqrt{(-4-2)^2 + (-2-2)^2} \\ &= \sqrt{36 + 16} \\ &= \sqrt{52} \end{aligned}$$

$$\begin{aligned} d_{AC} &= \sqrt{(8+4)^2 + (6+2)^2} \\ &= \sqrt{144 + 64} \\ &= \sqrt{208} \end{aligned}$$

$$\begin{aligned} \frac{AM}{AB} &= \frac{\sqrt{74}}{\sqrt{296}} & \frac{AN}{AC} &= \frac{\sqrt{52}}{\sqrt{208}} \\ &= \frac{1}{\sqrt{2}} & &= \frac{1}{\sqrt{2}} \end{aligned}$$

$$\therefore \frac{AM}{AB} = \frac{AN}{AC} = \frac{1}{\sqrt{2}}$$

$\therefore$  ~~sides~~  $\frac{AM}{AB} = \frac{AN}{AC}$  (sides are proportional)

$\therefore \triangle ABC \sim \triangle AMN$

$$\begin{aligned} \text{iv. } m_{MN} &= \frac{2-1}{2-5} \quad (2,2) \\ &= -\frac{1}{3} \end{aligned}$$

~~$\frac{2-1}{2-5} = \frac{1}{-3} = -\frac{1}{3}$~~

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(iv) continued

$$m = -\frac{1}{3} \quad (2, 2)$$

$$y - 2 = -\frac{1}{3}(x - 2)$$

$$3y - 6 = -x + 2$$

Equation  
of  $M_n$ 

$$\Rightarrow x + 3y - 8 = 0$$

$$\begin{aligned} \text{(v)} \quad d_{BC} &= \sqrt{(8-6)^2 + (6-12)^2} \\ &= \sqrt{4 + 36} \\ &= \sqrt{40} \\ &= \sqrt{2 \times 20} \\ &= \sqrt{2 \times 4 \times 5} \\ &= 2\sqrt{10} \end{aligned}$$

$$\begin{aligned} \text{(vi)} \quad m_{BC} &= \frac{8-6}{6-12} \\ &= -\frac{2}{6} \\ &= -\frac{1}{3} \quad (6, 8) \end{aligned}$$

$$y - 8 = -\frac{1}{3}(x - 6)$$

$$3y - 24 = -x + 6$$

$$x + 3y - 30 = 0$$



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~~(vi)  $(-2, -4)$   $x + 3y - 30 = 0$~~

~~$$d = \left| \frac{ax_1 + by_1 + c}{\sqrt{a^2 + b^2}} \right|$$~~

~~$$= \left| \frac{1(-2) + 3(-4) - 30}{\sqrt{1^2 + 3^2}} \right|$$~~

~~$$= \frac{44}{\sqrt{10}}$$~~

~~44 = 2\sqrt{10} \times h~~  
~~22 = \sqrt{10} \times h~~  
~~h = \frac{22}{\sqrt{10}}~~

$$(vi) \quad A = \frac{1}{2} \times b \times h$$

$$44 = \frac{1}{2} \times 2\sqrt{10} \times h$$

$$44 = \sqrt{10} h$$

$$h = \frac{44}{\sqrt{10}}$$

(b) i.  $y = \ln x$



ii.  $A \approx \frac{h}{2} [y_1 + y_n + 2(\quad)]$

$$\approx \frac{1}{2} [1 + 3 + 2(2)]$$

$$h = \frac{b-a}{n}$$

$$A \approx 4$$

iii.  $\int_1^3 \ln x \, dx$

$$h = \frac{3-1}{2}$$

$$h = \frac{2}{2}$$

$$h = 1$$

Less than the exact value.

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A large rectangular area with horizontal ruling lines, intended for writing a response.

You may ask for an extra Writing Booklet if you need more space.

