Start here for Question Number: 3

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

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

$= M\left(\frac{10}{2}, \frac{2}{2}\right)$

$= M(5,1)$

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

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

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

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

iii) ~~In ΔABC, ΔAMN~~
~~$\angle A$ is common~~
~~$\frac{AB}{AM}$ $\angle C$ 2C~~

In ΔABC, ΔAMN

$\angle A$ is common

$\frac{AB}{AM} = \frac{AC}{AO} = \frac{2}{1}$

(sides are proportional with same ratio)

$\therefore \Delta ABC \ ||| \ \Delta AMN$

(2 pairs of sides are in proportion and the included angle is equal)

iv) $M(5,1)$ $N(2,2)$

$m_{MN} = \frac{1-2}{5-2}$

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

$\therefore y - 1 = -\frac{1}{3}(x-5)$

$y - 1 = -\frac{1}{3}x + \frac{5}{3}$

$y = -\frac{1}{3}x + \frac{5}{3} + 1$

$y = -\frac{1}{3}x + \frac{8}{3}$

v) $d_{BC} = \sqrt{(x_2-x_1)^2 + (y_2-y_1)^2}$

$= \sqrt{(12-6)^2 + (6-8)^2}$

$= \sqrt{(6)^2 + (-2)^2}$

$= \sqrt{36+4}$

$= \sqrt{40} = 2\sqrt{10}$

$\therefore$ length of BC $= \cancel{\sqrt{40}}\ 2\sqrt{10}$ units

vi) $A = \frac{1}{2} b \times h$ $b = \cancel{\sqrt{40}}\ 2\sqrt{10} = d_{BC}$ $h = ?$ $A = 44$

$44 = \frac{1}{2} \times \cancel{\sqrt{40}}\ 2\sqrt{10} \times h$

$44 \times 2 \div \cancel{\sqrt{40}}\ 2\sqrt{10} = h$ $\rightarrow$ $44 \times \cancel{2} \times \frac{1}{\cancel{2}\sqrt{10}} = h$

~~$88 \times \frac{1}{\sqrt{40}} = h$~~

~~$h =$~~

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

$\therefore$ perp distance from A to BC $= \frac{44}{\sqrt{10}}$ units

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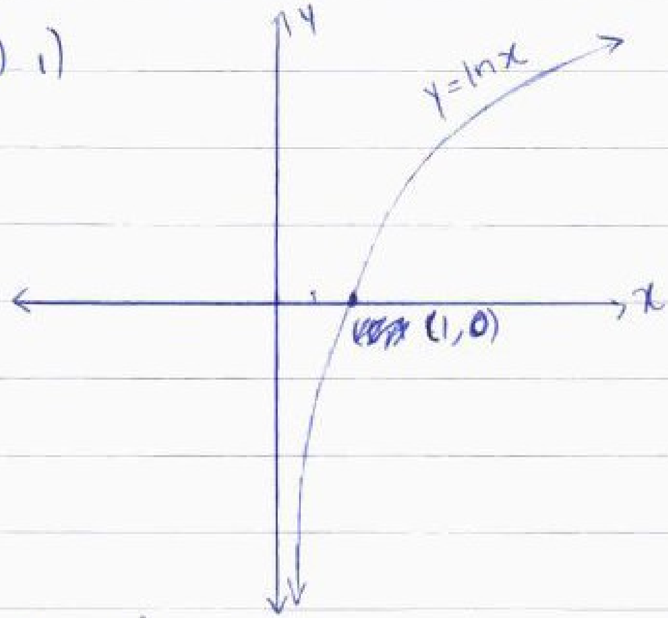
b) i)



ii) $\int_1^3 \ln x \, dx$

x	1	2	3
y	0.000	0.693	1.099

$= \frac{h}{3}\left[\text{first} + \text{last} + 2 \times \text{middle}\right]$

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

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

$= 1$

$= \frac{1}{3}\left[0 + 1.099 + 2 \times 0.693\right]$

$= \frac{497}{600}$

(iii) $\cancel{\int_1^3 \ln x \, dx}$

The approximation would be greater than the exact value of $\int_1^3 \ln x \, dx$ due to the approximation using areas of rectangles between the function values which means the approximation is slightly greater than the exact value as the rectangles go above the curve.

You may ask for an extra Writing Booklet if you need more space to answer question 3.