Start here for
Question Number: **3**

a) i)   M is midpoint $B(12,6)$ and $A(-2,-4)$

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

$$M = (5, 1)$$

ii) $B(12,6)$ $C(6,8)$

$$\text{gradient} = \frac{y_2 - y_1}{x_2 - x_1}$$

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

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

$$\text{gradient}_{BC} = -\frac{1}{3}$$

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

$$\text{gradient}_{NM} = \frac{2-1}{2-5}$$

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

$\therefore$ NM $\parallel$ BC

$\angle CAB$ is common

$\angle ANM = \angle ACB$ (Corresponding $\angle s$ NM $\parallel$ BC are equal)

$\triangle ABC \; ||| \; \triangle AMN$ (Equiangular)

iv) gradient $_{MN}$ = $-\frac{1}{3}$

$N(2,2)$

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

$3y - 6 = -x + 2$

$\therefore$ $x + 3y - 8 = 0$ is equation MN

v) $C(6,8)$ $B(12,6)$

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

$= \sqrt{6^2 + 2^2}$

$= \sqrt{40}$

$= 2\sqrt{10}$ units

vi) Area $= \frac{1}{2} \times b \times h$
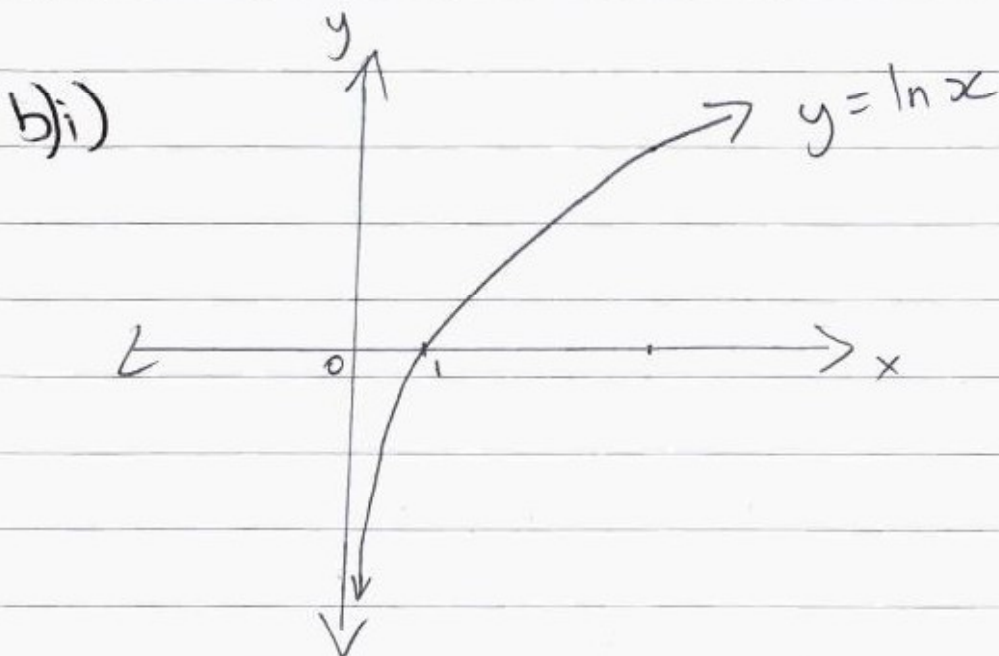
$44 = \frac{1}{2} \times 2\sqrt{10} \times h$

h is perpendicular distance from A to BC

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

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

$= \dfrac{22\sqrt{10}}{5}$

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b)i)

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

$$A = 2\frac{h}{2}(f_{i_2}$$

x	1	2	3
y	0	$\ln 2$	$\ln 3$
		0.693	1.098612

$$A = \frac{h}{2}\left(first + last + 4(rest)\right)$$
$$= \frac{1}{2}\left(0 + \ln 3 + 2(\ln 2)\right)$$
$$\doteqdot \quad \cancel{1.9356\ldots} \quad\quad 1.2424533$$

iii) $\int_1^3 \ln x \, dx$
$$= \left[\frac{1}{x}\right]_1^3$$
$$= \frac{1}{3} - 1$$

Area $\doteqdot 0.6666.$

$$\doteqdot -0.6666\ldots$$

The Approximation is greater $1.242 - 0.666 \doteqdot 0.5757$

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