Start here for Question Number: 3

a)(i) M is the midpoint of AB.

$$y = \frac{6+(-4)}{2}$$
$$= 1$$
$$x = \frac{12+(-2)}{2}$$
$$= 5$$

$\therefore$ Co-ordinates of M are $(5,1)$

(ii) $$\text{gradient} = \frac{8-6}{6-12}$$
$$= \frac{2}{-6}$$
$$= -\frac{1}{3}$$

(iii) In $\triangle ABC$ & $\triangle AMN$:

$\angle A$ is common

Gradient of $MN = \frac{2-1}{2-5} = -\frac{1}{3}$,

$\therefore MN \parallel BC$

$\Rightarrow \angle AOM = \angle ACB$ (corresponding angles)

$\therefore \triangle ABC \,|||\, \triangle AMN$ (equiangular)

(iv) Given $\text{gradient}_{MN} = -\frac{1}{3}$.

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

$$y-2 = -\frac{1}{3}(x-2)$$
$$y = -\frac{1}{3}x + \frac{2}{3} + 2$$
$$= -\frac{1}{3}x + \frac{8}{3}$$

(v) $$d_{BC} = \sqrt{(12-6)^2+(6-8)^2}$$
$$= \sqrt{36+4}$$
$$= \sqrt{40} \text{ units}$$

(vi) $A_{ABC} = \cancel{\ } \frac{1}{2}hb$

$= 44$

Given base (b) as BC ($\sqrt{40}$ units):

$A_{ABC} = h \times \sqrt{40} \times \frac{1}{2}$

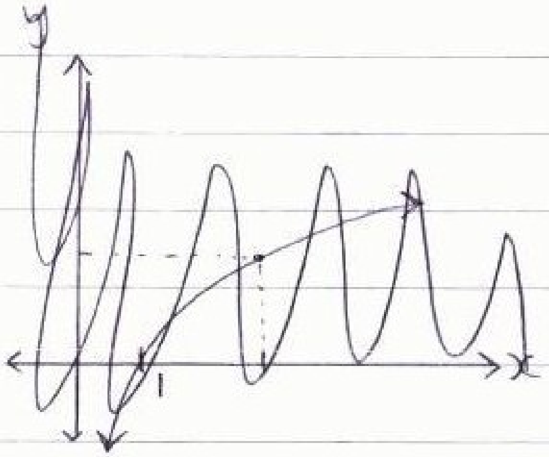
$\frac{1}{2}\sqrt{40}\,h = 44$

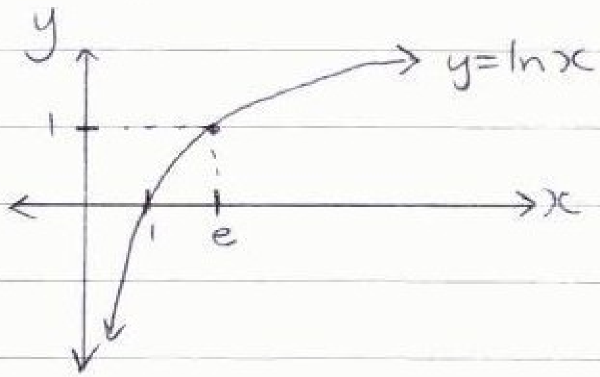
$\therefore \quad h = \frac{88}{\sqrt{40}}$

$= 13.914\ldots$

$\doteqdot 14$ units

b) i)





(ii)

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

Using trapezoidal rule:

$\int_1^3 \ln x \, dx \doteqdot \frac{h}{2}\left(f(a) + 2f\left(\frac{a+b}{2}\right) + f(b)\right)$

$\doteqdot \frac{1}{2}(0 + 2\ln 2 + \ln 3)$ $\longrightarrow$ PTO

Additional writing space on back page.

$\int_1^3 \ln x \, dx \doteqdot \frac{2}{2} \ln 2 + \frac{1}{2} \ln 3$

[illegible]

(iii) It will be greater than the exact value because some area above the curve is included when approximating using the trapezoidal rule.