

20th July 2022 ACHA4006 2005245

Q4

$$u = \frac{r(p^3 + T)}{Z}$$

$$u = \frac{r(p^3 - T)}{Z} \quad \frac{u}{Z} = r(p^3 - T)$$

$$\cancel{r\left(\frac{u}{Z}\right)} = \cancel{p^3 + T}$$

$$r\left(\frac{u}{Z}\right) - T = p^3 \quad r\left(\frac{u}{Z}\right) = p^3 + T$$

$$\sqrt[3]{r\left(\frac{u}{Z}\right) - T} = p$$

$$u = \frac{r(p^3 - T)}{Z}$$

$$uZ = r(p^3 - T)$$

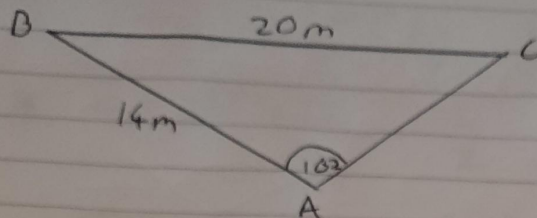
$$\frac{uZ}{r} = p^3 - T$$

$$\frac{uZ}{r} - T = p^3$$

$$\sqrt[3]{\frac{uZ}{r} - T} = p$$

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Q3



i) ~~Angle A~~

Sine rule

$$\frac{20}{\sin 102} = \frac{AC}{\sin B} = \frac{14}{\sin C}$$

Angle C

i) $\frac{20}{\sin 102} = \frac{14}{\sin C}$

$$\sin C = \frac{14 \sin 102}{20} = 0.5953...$$

$$\sin C = 36.53^\circ$$

$$\text{Angle } C = 36.53^\circ$$

ii) Angle B

~~Angle~~ $B = 180^\circ - 102^\circ - 36.53^\circ$
 $B = 41.47^\circ$

iii) $\frac{AC}{\sin 41.47} = \frac{20}{\sin 102}$

$$AC = \frac{20 \sin 41.47}{\sin 102} \quad \& AC = 13.54 \text{ m}$$

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Q4

$$u = \frac{r(\rho^3 - T)}{Z}$$

$$u = \frac{r(\rho^3 - T)}{Z} \quad \frac{u}{Z} = \frac{r(\rho^3 - T)}{Z^2}$$

$$\frac{u}{Z} = \rho^3 - T$$

$$r\left(\frac{u}{Z}\right) - T = \rho^3$$

$$\sqrt[3]{r\left(\frac{u}{Z}\right) - T} = \rho$$

$$u = \frac{r(\rho^3 - T)}{Z}$$

$$uZ = r(\rho^3 - T)$$

$$\frac{uZ}{r} = \rho^3 - T$$

$$\frac{uZ}{r} - T = \rho^3$$

$$\sqrt[3]{\frac{uZ}{r} - T} = \rho$$

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Q5

i) ~~$2^{x+3} = 4x$~~
 ~~$\log 2^{x+3} = 4x$~~
 ~~$(x+3) \log 2 = 4x$~~
 ~~$(x+3) 0.30 = 4x$~~ ~~$1.7x + 0.9 = 4x$~~

~~$2^{x+3} = 4x$~~

~~$4(2^{x+3}) = x$~~

$2^{x+3} = 4$

$\log 2^{x+3} = 4x$

$(x+3) \log 2 = 4x$

$(x+3) 0.30 = 4x$

=

ii) $\log(x+4) + \log(x+1) = \log(x+9) + \log(x+2)$

$(x+4)(x+1) = (x+9)(x+2)$

$5x + 4 = 11x + 18$

$-14 = -6x$

$\frac{-14}{-6} = x$

$x = 2.3$

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Q5

i) ~~$2^{x+3} = 4x$~~
 ~~$\log 2^{x+3} = 4x$~~
 ~~$(x+3) \log 2 = 4x$~~
 ~~$(x+3) 0.30 = 4x$~~ ~~$(x+3) 0.7 = 4x$~~

~~$2^{x+3} = 4x$~~

~~$4(2^{x+3}) = x$~~

$2^{x+3} = 4$

$\log 2^{x+3} = 4x$

$(x+3) \log 2 = 4x$

$(x+3) 0.30 = 4x$

=

ii) $\log(x+4) + \log(x+1) = \log(x+9) + \log(x+2)$

$(x+4)(x+1) = (x+9)(x+2)$

$5x + 4 = 11x + 18$

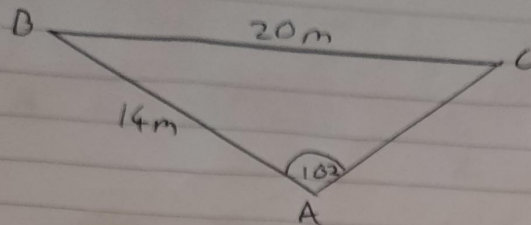
$-14 = -6x$

$\frac{-14}{-6} = x$

$x = 2.3$

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Q3



i) ~~Angle A~~

Sine rule

$$\frac{20}{\sin 102} = \frac{AC}{\sin B} = \frac{14}{\sin C}$$

Angle C

i) $\frac{20}{\sin 102} = \frac{14}{\sin C}$

$$\sin C = \frac{14 \sin 102}{20} = 0.5953...$$

$$\sin C = 36.53^\circ$$

$$\text{Angle } C = 36.53^\circ$$

ii) Angle B

~~Angle~~ $B = 180^\circ - 102^\circ - 36.53^\circ$
 $B = 41.47^\circ$

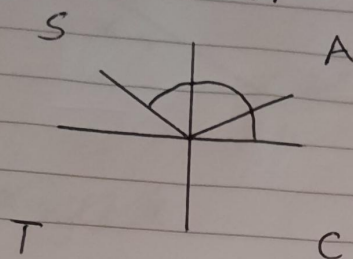
iii) $\frac{AC}{\sin 41.47} = \frac{20}{\sin 102}$

$$AC = \frac{20 \sin 41.47}{\sin 102} \quad \text{or } AC = 13.54 \text{ m}$$

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Q2

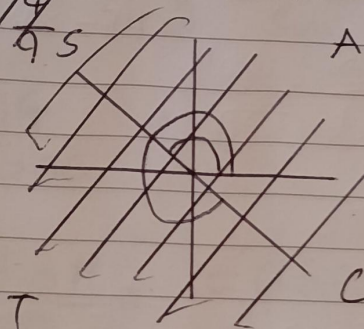
i) $\sin x = 0.87$ $x = 60.46^\circ$



$x = 180 - 60.46$

$x = 119.54^\circ$

ii) ~~$4 \tan x = 9$~~ ~~$\tan x = \frac{9}{4}$~~ ~~$x = 66.04^\circ$~~

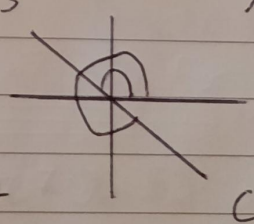


~~$x = 180 - 66.04$~~
 ~~$x = 113.96^\circ$~~

~~$x = 360 - 66.04$~~
 ~~$x = 293.96^\circ$~~

$4 \tan x = 9$
 $\tan x = \frac{9}{4}$

$x = 66.04^\circ$

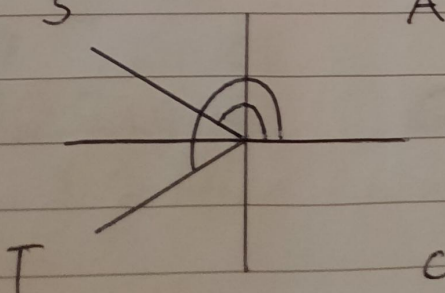


$x = 180 - 66.04$
 $x = 113.96$

$x = 360 - 66.04$
 $x = 293.96$

iii) $7 \cos x = 2$

$\cos x = \frac{2}{7}$ $x = 73.40^\circ$



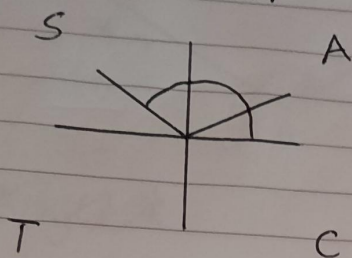
$x = 180 - 73.40$
 $x = 106.6^\circ$

$x = 190 + 73.40$
 $x = 253.40^\circ$

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Q2

i) $\sin x = 0.87$ $x = 60.46^\circ$

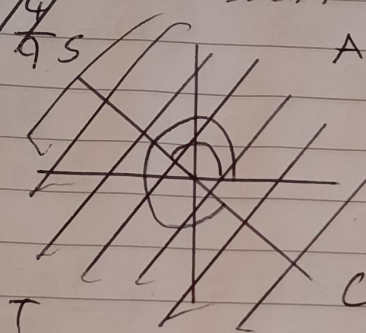


$x = 180 - 60.46$

$x = 119.54^\circ$

ii) ~~$4 \tan x = 9$~~
 ~~$\tan x = \frac{9}{4}$~~

~~$x = 66.96^\circ$~~

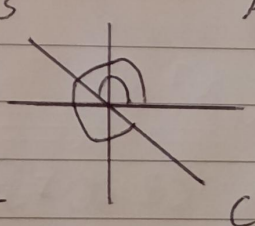


~~$x = 180 - 66.96$~~
 ~~$= 113.04^\circ$~~

~~$x = 360 - 66.96$~~
 ~~$= 293.04^\circ$~~

$4 \tan x = 9$
 $\tan x = \frac{9}{4}$

$x = 66.04^\circ$

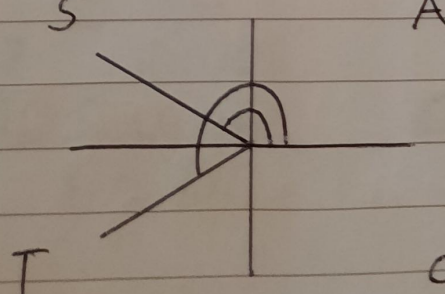


$x = 180 - 66.04$
 $= 113.96$

$x = 360 - 66.04$
 $= 293.96$

iii) $7 \cos x = 2$

$\cos x = \frac{2}{7}$ $x = 73.40^\circ$



$x = 180 - 73.40$
 $= 106.6^\circ$

$x = 190 + 73.40$
 $x = 253.40^\circ$

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Q1

i) ~~$y = 6x^3 + 2x^2 + 7x$~~ $y = 6x^3 + 2x^2 + 7x - 10$

~~$\frac{dy}{dx} = 18x^2 + 4x + 7$~~
 $y = (6x^3) + (2x^2) + (7x) - 10$
 $y = 6x^3 + 2x^2 + 7x - 10$
 ~~$\frac{dy}{dx} = 18x^2 + 4x + 7$~~
 $\frac{dy}{dx} = 30x^2 + 4x + 7$

ii) $y = (x+7)(x-2)$
 $y = x^2 + 7x + 7x - 14$
 $y = x^2 + 14x - 14$

~~$y = x^2 + 7x + 7x - 14$~~
 ~~$y = x^2 + 14x - 14$~~
 $\frac{dy}{dx} = x^2 + 14x$

iii) $y = x^{-9} - \sin 3x$ $y = x^{-9} + \sin 3x$

$\frac{dy}{dx} = -9x^{-9} - 3 \cos 3x$

iv) ~~$y = e^{7x} \sin 5x$~~ $y = e^{7x} \sin 5x$

~~$\frac{dy}{dx} = (\sin 5x)(7e^{7x}) + (e^{7x})(5 \cos 5x)$~~
 $\frac{dy}{dx} = (\sin 5x)(7e^{7x}) + (e^{7x})(5 \cos 5x)$

v) $y = \frac{x^2}{\cos x}$

vi) $y = \sqrt{8x^4 + x + 7}$ $y = (8x^4 + x + 7)^{0.5}$

$\frac{dy}{dx} = 0.5(8x^4 + x + 7)^{-0.5} (32x - 1)$

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Q1

i) ~~$y = 6x^3 + 2x^2 + 7x$~~ $y = 6x^3 + 2x^2 + 7x - 10$

~~$\frac{dy}{dx} = 18x^2 + 4x + 7$~~
 $y = (6x^3) + (2x^2) + (7x) - 10$
 $y = 6x^3 + 2x^2 + 7x - 10$
 $\frac{dy}{dx} = 18x^2 + 4x + 7$

ii) $y = (x+7)(x-2)$
 $y = x^2 + 7x + 7x - 14$
 $y = x^2 + 14x - 14$

~~$y = x^2 + 7x + 7x + 1$~~
 ~~$y = x^2 + 14x + 1$~~
 $\frac{dy}{dx} = x^2 + 14x$

iii) $y = x^{-9} - \sin 3x$ $y = x^{-9} + \sin 3x$

$\frac{dy}{dx} = -9x^{-10} - 3 \cos 3x$

iv) ~~$y = e^{7x} \sin 5x$~~ $y = e^{7x} \sin 5x$

$\frac{dy}{dx} = (\sin 5x)(7e^{7x}) + (e^{7x})(5 \cos 5x)$

v) $y = \frac{x^2}{\cos x}$

vi) $y = \sqrt{8x^4 + x + 7}$ $y = (8x^4 + x + 7)^{0.5}$

$\frac{dy}{dx} = 0.5(8x^4 + x + 7)^{-0.5} (32x^3 + 1)$