

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

$$\frac{dy}{dx} = \underline{21x^2 - 4x + 1}$$

ii) $y = (x+3)(x+2)$

$$y = x^2 + 5x + 6$$

$$\frac{dy}{dx} = \underline{2x + 5}$$

iii) $y = \frac{1}{x^3} + \sin 3x$
 $= x^{-3} + \sin 3x$

$$\frac{dy}{dx} = \underline{-3x^{-4} + 3 \cos 3x}$$

iv) $y = x^4 \tan 2x$

$$\frac{dy}{dx} = \underline{4x^3 \sec^2 2x}$$

v) $y = \frac{e^{2x}}{\cos 2x} \quad \begin{matrix} -u & \frac{dv}{dx} = 2e^{2x} & \frac{dv}{dx} = \\ -v & & (-\sin 2x) \end{matrix}$

$$\frac{dy}{dx} = \underline{\frac{(\cos 2x)(2e^{2x}) - (e^{2x})(-\sin 2x)}{(\cos 2x)^2}}$$

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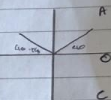
1/vi) $y = (5x^2 + 2x + 1)^5$

$$\frac{dy}{dx} = 5(5x^2 + 2x + 1)^4(10x + 2)$$

2. i) $\sin x = 0.65$

$$x = \sin^{-1} 0.65$$

$$x = 40.54^\circ$$



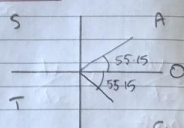
$$x = 180 - 40.54 = 139.46^\circ$$

ii) $7 \cos x = 4 \rightarrow \cos x = \frac{4}{7}$

$$= \cos^{-1} \left(\frac{4}{7}\right) = 55.15^\circ$$

$$x = 360 - 55.15$$

$$x = 304.85^\circ$$



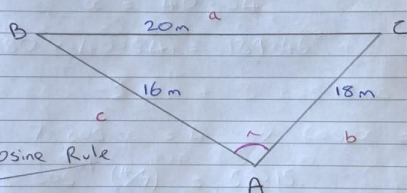
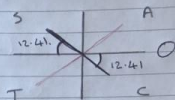
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2. iii) $\tan x = -0.22$

$x = \tan^{-1}(-0.22)$
 $= 12.41$

$x = 180 - 12.41$
 $= 167.59^\circ$

$x = 360 - 12.41$
 $= 347.59^\circ$



Cosine Rule

3) $20^2 = 18^2 + 16^2 - 2(18)(16) \cos(A)$

$400 = 324 + 256 - 576 \cos(A)$

~~400 = 324 + 256 - 576 \cos(A)~~

$400 - 324 - 256 = -576 \cos(A)$
 $-180 = -576 \cos(A)$

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$$3) \frac{-180}{-576} = \cos(A)$$

$$0.3125 = \cos(A)$$

$$\cos^{-1}(0.3125) = 71.79^\circ$$

is at angle A.

$$4) P = \sqrt{\frac{xy}{T}} + 3 \quad [x]$$

$$P^2 = \frac{xy}{T} + 3$$

~~$$P^2 T = xy + 3T$$~~

$$P^2 T = xy + 3$$

$$3(P^2 T) = xy$$

$$\frac{3(P^2 T)}{y} = x$$

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5. i) $5^{x+2} = 2x$
 (3rd law) (3rd law)

$(x+2) \log 5 = \log 2x$
 $(x+2) \log 5 = x \log 2$

$(x+2) 0.6990 = 0.3010$

$0.6990x + 1.338 = 0.3010x$

$+ 1.338 = 0.3010x - 0.6990x$

$+ 1.338 = -0.398x$

$1.338 = -x$

-0.398

$-3.362 = x$

ii) $\log(x+2) + \log(x+3) = 2\log(x+1)$
 1st law 3rd law

$\log(x+2)(x+3) = \log(x+1)^2$
 Foil (x+1)(x+1)

$2 \times 3 \quad x^2 + 5x + 6 = x^2 + 2x + 1$

1×2

Further Maths - ACHA4006

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5ii) $(x+2)(x+3) = (x+1)(x+\frac{1}{2})$

$(x^2 + 5x + 6) = x^2 + 2x + 1$

$+ 5x + 6 \Rightarrow + 2x + 1$

$5 - 2x = +1 - 6$

$3x = -5$

$x = \frac{-5}{3}$

$x = -1.67$

Further Maths - ACHA4006

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b) i) $\int x^4 + 3x^2 - 3x + 1 \, dx$

$$dx \quad \int \frac{x^5}{5} + \frac{3x^3}{3} - \frac{3x^2}{2} + x + c$$

ii) $\int (x-1)(x-3) \, dx$

foil.

$$\int \frac{x^2 - 3x - 1x + 3}{x^2 - 4x + 3}$$

$$dx \quad \int \frac{x^2}{3} - \frac{4x^2}{2} + 3x + c$$

iii) $\int 3 \sec^2 2x \, dx$

$$3 \int \sec^2 2x \, dx$$

$$3 \times \int \frac{1}{2} \tan 2x$$

$$dx \quad \int \frac{3}{2} \tan 2x$$

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6. iv) $\int_0^4 (x+3)(x+2) dx$
 $\int_0^4 x^2 + 5x + 6$

$\int \frac{x^3}{3} + \frac{5x^2}{2} + 6x$

Top: $\left[\frac{(4)^3}{3} + \frac{5(4)^2}{2} + 6(4) \right] - 0$

$21.34 + 40 + 24$

$= 85.34$

v) $\int_2^3 x(x+1) + e^x dx$
 $\int_2^3 x^2 + x + \ln x$
 $\int \frac{x^3}{3} + \frac{x^2}{2} + \ln x$

Top: $\left[\frac{(3)^3}{3} + \frac{(3)^2}{2} + \ln(3) \right] -$

Bot: $\left[\frac{(2)^3}{3} + \frac{(2)^2}{2} + \ln(2) \right]$

Further Maths - ACHA4006

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$$6v. \quad [\cancel{11} 9 + 2 + \overset{1.0986}{\cancel{0.6931}}]$$

$$[2.6 + 2 + 0.6931]$$

$$[12.0986] - [5.2931]$$

$$= \underline{6.8055}$$