

Q1)

a) x^q

b)
$$\begin{aligned} & \frac{(x+q)(x-q)}{(x+q)(x-q)} \\ &= \frac{1}{x-q} \end{aligned}$$

c)
$$z = \frac{2x+q}{p+x} \quad [x]$$

$$z(p+x) = 2x+q$$

$$zp + zx = 2x + q$$

$$zx - 2x = q - zp$$

$$x(z-2) = q - zp$$

$$x = \frac{q - zp}{z-2}$$

$$d) \quad \begin{aligned} 2x + 4y &= 12 & (1) & \times 3 \\ 3x + 5y &= 17 & (2) & \times 2 \end{aligned}$$

$$\begin{aligned} 6x + 12y &= 36 & (3) \\ 6x + 10y &= 34 & (4) \end{aligned} \quad -$$

$$2y = 2$$

$$(y = 1) \rightarrow \text{in } (1)$$

$$2x + 4 = 12$$

$$2x = 8$$

$$(x = 4)$$

e)

$$(i) \quad 10x^2 + 2x - 5 = 0$$

$\begin{matrix} \uparrow & & \uparrow & \uparrow \\ a & & b & c \end{matrix}$

$$x = \frac{-2 \pm \sqrt{(2)^2 - 4(10)(-5)}}{2(10)}$$

$$= \frac{-2 \pm \sqrt{4 + 200}}{20}$$

$$= \frac{-2 \pm 14.28}{20}$$

$$x = 0.614$$

$$x = -0.814$$

$$(i) \quad x^2 + 5x + 6 = 0$$

$$(x+2)(x+3) = 0$$

$$x = -2 \quad x = -3$$

(3)

(ii)

$$\frac{5x+1}{3} = \frac{x+6}{2}$$

$$2(5x+1) = 3(x+6)$$

$$10x+2 = 3x+18$$

$$10x - 3x = 18 - 2$$

$$7x = 16$$

$$x = \frac{16}{7} \quad 2.29$$

(3)

(iv)

$$\ln(x+2) + \ln(x+3) = 2\ln(x+5)$$

$$\ln(x+2)(x+3) = \ln(x+5)^2$$

$$x^2 + 5x + 6 = x^2 + 10x + 25$$

$$6 - 25 = 10x - 5x$$

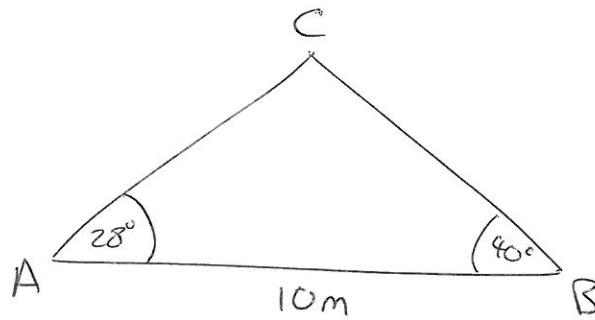
$$-19 = 5x$$

$$-3.8 \quad \frac{-19}{5} = x$$

(3)

Q2)

a)



$$\hat{C} = 180^\circ - 28^\circ - 40^\circ$$

$$= 112^\circ$$

Sine Rule:

(i)

$$\frac{BC}{\sin 28} = \frac{AC}{\sin 40} = \frac{10}{\sin 112}$$

$$AC = \frac{10 \sin 40}{\sin 112}$$

$$AC = 6.93 \text{ m}$$

(ii)

$$BC = \frac{10 \sin 28}{\sin 112}$$

$$BC = 5.06 \text{ m}$$

b) Cosine Rule.

$$(BC)^2 = (12)^2 + (10)^2 - 2(12)(10)\cos 38$$

$$(BC)^2 = 144 + 100 - 240(0.79)$$

$$(BC)^2 = 244 - 189.6$$

$$BC = \sqrt{54.4}$$

$$BC = 7.38 \text{ m}$$

c)

$$(i) \frac{5x+14}{(x+1)(x+4)} = \frac{A}{(x+1)} + \frac{B}{(x+4)}$$

$$5x+14 = A(x+4) + B(x+1)$$

$$x = -1$$

$$9 = 3A$$

$$3 = A$$

$$x = -4$$

$$-6 = -3B$$

$$2 = B$$

$$\therefore \text{ pfs are } \left(\frac{3}{(x+1)} + \frac{2}{(x+4)} \right)$$

$$(i) \frac{3x+1}{(x+2)(x+3)^2} = \frac{A}{(x+2)} + \frac{B}{(x+3)} + \frac{C}{(x+3)^2}$$

$$\therefore 3x+1 = A(x+3)^2 + B(x+2)(x+3) + C(x+2)$$

$$x = -2$$

$$-5 = A$$

$$x = -3$$

$$-8 = -C$$

$$8 = C$$

$$x = 0$$

$$1 = 9A + 6B + 2C$$

$$1 = -4A + 6B + 16$$

$$A = B$$

$\therefore$ P.F.s are :

$$= \frac{-5}{(x+2)} + \frac{5}{(x+3)} + \frac{8}{(x+3)^2}$$

$$d) = 1$$

1
①

$$e) 5^{x+1} = 8$$

$$\ln 5^{x+1} = \ln 8$$

$$(x+1)\ln 5 = \ln 8$$

$$1.61x + 1.61 = 2.08$$

$$x = \frac{0.47}{1.61}$$

$$x = 0.29$$

1

1

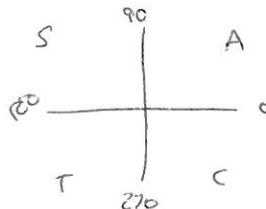
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③

Q3)

a) (i) $\sin x = 0.44$

$$x = 26.10^\circ$$

$$x = 153.90^\circ$$



b) (ii) $4 \cos x = 3$

$$\cos x = 3/4$$

$$x = 41.41^\circ$$

$$x = 318.59^\circ$$

(iii) $\tan x = -2.5$

$$\tan x = 2.5$$

$$x = 68.20^\circ$$

$$x = 111.8^\circ$$

$$x = 291.8^\circ$$

(iv) $7 \cos x = -6$

$$\cos x = \frac{-6}{7}$$

$$\cos x = \frac{6}{7}$$

$$x = 31^\circ$$

$$x = 149^\circ$$

$$x = 211^\circ$$

Q4)

a)

$$(i) \frac{dy}{dx} = 10x + 3$$

| | ②

$$(ii) \frac{dy}{dx} = 2x + 8$$

| | ③

$$(iii) y = e^{6x} \sin 3x$$

$\uparrow \quad \quad \uparrow$
 $u \quad \quad v$

$$\frac{du}{dx} = 6e^{6x} \quad \frac{dv}{dx} = 3\cos 3x$$

| |

$$\frac{dy}{dx} = (\sin 3x)(6e^{6x}) + (e^{6x})(3\cos 3x)$$

| |

$$(iv) y = \frac{e^{5x}}{\sin 2x}$$

$\leftarrow u$
 $\leftarrow v$

④

$$\frac{du}{dx} = 5e^{5x} \quad \frac{dv}{dx} = 2\cos 2x$$

| |

$$\frac{dy}{dx} = \frac{(\sin 2x)(5e^{5x}) - (e^{5x})(2\cos 2x)}{(\sin 2x)^2}$$

| |

| ⑤

$$(v) \frac{dy}{dx} = 4(5x^2 + 2x - 1)^3 (10x + 2)$$

||

⑥

$$b) x^2 - 7x + 12$$

$$\therefore (x - 4)(x - 3)$$

$$(\tan x - 4)(\tan x - 3) = 0$$

$$\tan x = 4$$

$$\boxed{x = 75.96^\circ}$$

$$\boxed{x = 255.96^\circ}$$

$$\tan x = 3$$

$$\boxed{x = 71.57^\circ}$$

$$\boxed{x = 251.57^\circ}$$

⑧

$$c) y = re^{-kt} \quad [k]$$

$$\frac{y}{r} = e^{-kt}$$

$$\ln\left(\frac{y}{r}\right) = \ln e^{-kt}$$

$$\ln\left(\frac{y}{r}\right) = -kt \ln e^{\rightarrow 1}$$

$$\boxed{\frac{\ln\left(\frac{y}{r}\right)}{-t} = k}$$

$$t = 1$$

$$r = 4$$

$$y = 2$$

$$\frac{\ln\left(\frac{2}{4}\right)}{-1} = k$$

$$\frac{-0.69}{-1} = k$$

$$\boxed{0.69 = k}$$

⑥

b)

$$y = \sqrt{3x^2 - 5}$$

$$= (3x^2 - 5)^{1/2}$$

$$\frac{dy}{dx} = \frac{1}{2} (3x^2 - 5)^{-1/2} (6x)$$

1
1
1
③

c)

$$z = 4x^3 + 2x^2y^3 + 2y^4$$

$$\frac{\partial z}{\partial x} = 12x^2 + 4xy^3$$

$$\frac{\partial^2 z}{\partial x^2} = 24x + 4y^3$$

$$\frac{\partial^2 z}{\partial y \partial x} = \cancel{4x} 12xy^2$$

$$\frac{\partial z}{\partial y} = 6x^2y^2 + 8y^3$$

$$\frac{\partial^2 z}{\partial y^2} = 12x^2y + 24y^2$$

$$\frac{\partial^2 z}{\partial x \partial y} = 12xy^2$$

1 1
1 1
1 1
⑥

