

2113867 - ACHA4000
 $x = -1$.

Q. (iii) $2 \log(3x+1) = \log(2x+3) + \log(x+7)$.
 ~~$(x+3)(x+7)$~~

$$x^2 + 10x + 21$$

$$(\log(3x+1))^2 = \log(x^2 + 10x + 21)$$

$$(3x+1)^2 = 9x^2 + 6x + 1$$

$$9x^2 + 6x + 1 = x^2 + 10x + 21$$

$$8x^2 - 4x - 20 = 0$$

~~$x = 1.85$~~

$x = 1.35$

(b)
(i) $2P^2Q^2 - 4P^2Q^3 + 2P^3Q$

$2P^2Q(4PQ - 2Q^2 + P)$

• (4) $y = 5x^2 + 12x - 14$

$$y = 4x^2 + 3x - 4.$$

$$14 = 5x^2 + 12x - y.$$

$$4 = 4x^2 + 3x - y.$$

• ~~20~~ $56 = 20x^2 + 48x - 4y.$

$$20 = 20x^2 + 16x - 5y.$$

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(3)

(i) $\sin x = 0.67$

$$x = \sin^{-1}(0.67)$$

$$x = 42.0767$$

$$x = 42.0767, 137.9233$$

(ii) $\tan \theta = x$

$$x^2 + 7x + 10 = 0$$

$$(x+5)(x+2) = 0$$

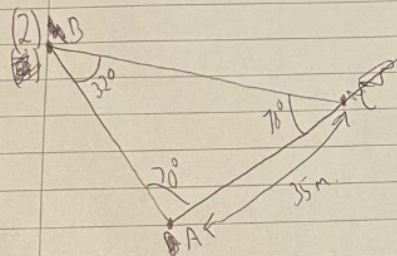
$$x = -5$$

$$x = -2$$

$$\theta = 78.69^\circ, -63.43^\circ$$

$$\theta = 101.31, 116.5656, 281.31, 296.51$$

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$$(i) 180 - 70 - 32 = 78^\circ$$

$$(ii) \frac{\sin 78}{AB} = \frac{\sin 32}{35}$$

$$AB = 32.623 \text{ m}$$

$$AB = 32.62 \text{ m}$$

$$(iii) \frac{\sin 32}{35} = \frac{\sin 70}{BC}$$

$$BC = 49.120 \text{ m}$$

$$BC = 49.12 \text{ m}$$

6(11)

~~Handwritten scribble~~

(C)

$$x^2 + 10x + 2x + 20 = 0.$$

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

$$x = -10 \quad x = -2$$

$$(iii) 2x^2 + x - 15 = 0.$$

$$2x^2 + x - 30 = 0$$

$$2x^2 + 6x - 5x - 30 = 0$$

$$2x(x+3) - 5(x+6) = 0.$$

$$(x+3) = 0$$

$$x = -3$$

$$(2x-5)^2 = 0.$$

$2x - 5$

$$x = \frac{5}{2}$$

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(6)

(a)

(i) $y = 9x^3 + 7x^2 - x + 4$

$$\frac{dy}{dx} = 27x^2 + 14x - 1$$

(ii) $y = (2x+3)(3x-5)$

$$y = 6x^2 - 10x + 9x - 15$$

$$y = 6x^2 - x - 15$$

$$\frac{dy}{dx} = 12x - 1$$

(iii) $y = 2\ln x + \frac{5}{x}$

$$\frac{dy}{dx} = \frac{2}{x} - \frac{5}{x^2}$$

(iv) $y = 7\sin x + 3\cos 2x + \tan \frac{x}{2}$

$$\frac{dy}{dx} = 7\cos x - 6\sin 2x + \frac{1}{2} \sec^2 \frac{x}{2}$$

(v) $y = x^5 \sin 2x$

$$\frac{dy}{dx} = 5x^4 + 2x^5 \cos 2x$$

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(7)

$$(a) \int x^5 + 2x^2 + x - 10 dx.$$
$$\frac{x^6}{6} + \frac{2x^3}{3} + \frac{x^2}{2} - 10x + C.$$

$$(ii) \int (2x+5)(x^2-1).$$

$$\int 2x^3 + 5x^2 - 2x - 5.$$

$$= \frac{2x^4}{4} + \frac{5x^3}{3} - \frac{2x^2}{2} - 5x + C.$$

$$= \frac{x^4}{2} + \frac{5x^3}{3} - x^2 - 5x + C.$$

$$(iii) \int_2^5 2x^4 + 6x^2$$

$$= \frac{5}{2} \left[\frac{2x^5}{5} + \frac{6x^3}{3} \right] = 147.2.$$

$$(iv) \int_0^{\pi/3} 5 \sin 3x - \cos(x)$$

$$= \frac{-5 \cos 3x}{3} - \sin(x) + C.$$

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6 (Vi) $y = \frac{e^{3x}}{x^3}$

$$f(x) = e^{3x} \quad g(x) = x^3$$

$$f'(x) = 3e^{3x} \quad g'(x) = 3x^2$$

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

$$\frac{dy}{dx} = \frac{3x^3 e^{3x} - 3e^{3x} x^2}{x^6}$$

$$\frac{dy}{dx} = \frac{3x e^{3x} - 3e^{3x}}{x^4}$$

$$\frac{dy}{dx} = 3e^{3x} \left(\frac{x-1}{x^4} \right)$$

(Vii) $(5x^2 - 2x + 1)^5$

$$5x^2 - 2x + 1 = z$$

$$y = z^5$$

$$\frac{dy}{dz} = 5z^4$$

$$\frac{dz}{dx} = 10x - 2$$

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

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(1)

(a)

(i) $\frac{3x-1}{5} = \frac{6x+5}{9}$

$$9(3x-1) = 5(6x+5)$$

$$27x - 9 = 30x + 25$$

$$-25 - 9 = 30x - 27x$$

$$-34 = 3x$$

$$x = \frac{-34}{3}$$

$$x = -11.33$$

(ii)

~~$x^2 + 11x + 6 = 0$~~

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