

Ken DAVIES 6/11/20

Question 1)

a)

$$i) y = 8x^3 - 2x^2 - x + 1$$

$$\frac{dy}{dx} = 3(8x^2) - 2(2x) - 1$$

$$\frac{dy}{dx} = 24x^2 - 4x - 1$$

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

$$y = -3x + 15^2$$

$$y = -9x + 225$$

$$iii) y = \frac{7}{x^2} + 4e^{3x}$$

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

$$vi) y = \frac{\sin 5x}{x^3 + 3x + 4}$$

$$\frac{du}{dx} = 5\cos 5x$$

$$\frac{dv}{dx} = x^3 + 3x + 4$$

$$\frac{dy}{dx} = \frac{(x^3 + 3x + 4)(5\cos 5x) - (\sin 5x)(x^3 + 3x + 4)}{(x^3 + 3x + 4)^2}$$

Keri DAVIES 6/11/20

$$\text{vii) } y = \sqrt{3x^3 + 2x + 5}$$

$$y = (6x^3 + 2x + 5)^{0.5}$$

$$\frac{dy}{dx} = 0.5 (6x^2 + 2x + 1)^{-0.5} (12x + 2)$$

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Question 2)

$$i) \frac{2x+3}{6} = \frac{x}{3} + \frac{5x-1}{6} \quad 6$$

$$6\left(\frac{2x+3}{6}\right) = \frac{6x}{3} + 6\left(\frac{5x-1}{6}\right)$$

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

$$2x+3 = 2x + 5x - 1$$

$$3+1 = 2x+5x-2x$$

$$4 = 5x$$

$$\frac{4}{5} = x$$

$$ii) 2\ln(x+6) = \ln(x+3) + \ln(x+7)$$

$$\log(x+6)^2 = \log(x+3)(x+7)$$

$$(x+6)(x+6) = (x+3)(x+7)$$

$$x^2 + 6x + 6x + 36 = x^2 + 7x + 3x + 21$$

$$12x + 36 = 10x + 21$$

$$12x - 10x = 21 - 36$$

$$2x = -15$$

$$x = \frac{-15}{2}$$

$$\text{iii)} \quad 3^{x+5} = 2^{\frac{x}{3}} \times 6$$

$$\log 3^{(x+5)} = \log 2^{\frac{x}{3}} \times 6$$

$$(x+5) \log 3 = x \log 2 + \log 6$$

$$(x+5) 0.47 = 0.30x + 0.78$$

$$0.47x + 2.35 = 0.30x + 0.78$$

$$0.47x - 0.30x = 0.78 - 2.35$$

$$0.17x = -1.57$$

$$x = \frac{-1.57}{0.17}$$

$$x = -9.24$$

b)

$$y = x^2 + 2x + 2 \quad \textcircled{1}$$

$$y = 2x^2 + 11x + 10 \quad \textcircled{2}$$

$$\textcircled{2} - \textcircled{1} \quad 0 = x^2 + 9x + 8$$

$$0 = (x+1)(x+8)$$

1x8
8x1
2x4
4x2

$$(2x+1)(x+8) = 0$$

$$2x^2 + 16x + x + 8 = 0$$

$$(2x+8)(x+1) = 0$$

$$2x^2 + 2x + 8x + 8 = 0$$

$$(2x+4)(x+2) = 0$$

$$2x^2 + 4x + 4x + 8 = 0$$

$$(2x+2)(x+4) = 0$$

$$2x^2 + 8x + 2x + 8 = 0$$

$$(x+1)(x+8) = 0$$

$$x^2 + 8x + 1x + 8 = 0$$

$$(x+8)(x+1) = 0$$

$$x^2 + 1x + 8x + 8 = 0$$

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c) $9x^2 - 4x - 5 = 0$

$$x = \frac{-4 \pm \sqrt{4^2 - 4(9)(-5)}}{2(9)}$$

$$x = \frac{-4 \pm \sqrt{16 + 180}}{18}$$

$$x = \frac{-4 \pm \sqrt{196}}{18}$$

$$x = \frac{-4 \pm 14}{18}$$

$$x = \frac{-4 + 14}{18}$$

$$x = \frac{-4 - 14}{18}$$

$$x = \frac{10}{18}$$

$$x = \frac{-18}{18}$$

$$x = 0.56$$

$$x = -1$$

d)

i) $x^2 + 11x + 30 = 0$

$$(x+5)(x+6) = 0$$

$$x+5=0 \quad x+6=0$$

$$x = -5 \quad x = -6$$

$$(x+6)(x+5) = 0$$

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

ii) $x^2 + 13x + 22 = 0$

$$(x+11)(x+2) = 0$$

$$x+11=0 \quad x+2=0$$

$$x = -11 \quad x = -2$$

$$(x+11)(x+2) = 0$$

$$x^2 + 2x + 11x + 22 = 0$$

iii) $x^2 + 100 = 0$

$$(x+10)(x-10) = 0$$

$$x^2 - 10x + 10x - 100$$

$$x+10=0 \quad x-10=0$$

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

$$\text{iv) } 2x^2 + 7x + 5 = 0$$

$$(2x+5)(x+1) = 0$$

$$2x+5=0 \quad x+1=0$$

$$2x = -5$$

$$x = -1$$

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

$$\begin{array}{l} 1 \times 5 \\ 5 \times 1 \end{array}$$

$$(2x+5)(x+1) = 0$$

$$2x^2 + 10x + 1x + 5$$

$$(2x+5)(x+1) = 0$$

$$2x^2 + 2x + 5x + 5 = 0$$

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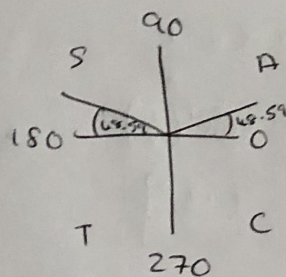
Question Three)

9)

i) $\sin x = 0.75$

$$x = \sin^{-1}(0.75)$$

$$x = 48.59^\circ$$



$$x = 180 - 48.59$$

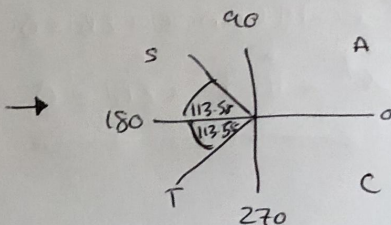
$$x = 131.41^\circ$$

ii) $-5 \cos x = 2$

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

$$x = \cos^{-1}\left(\frac{2}{-5}\right)$$

$$x = 113.58^\circ$$



$$x = 180 + 113.58$$

$$x = 293.58^\circ$$

$$x = 180 - 113.58$$

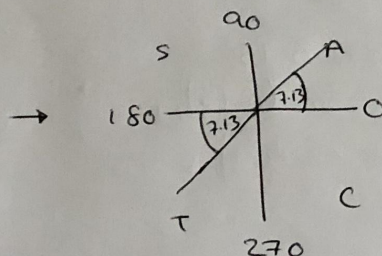
$$x = 66.42^\circ$$

iii) $8 \tan x = 1$

$$\tan x = \frac{1}{8}$$

$$x = \tan^{-1}\left(\frac{1}{8}\right)$$

$$x = 7.13^\circ$$



$$x = 180 + 7.13$$

$$x = 187.13^\circ$$

iv) $\tan^2 x - 14 \tan x + 24 = 0$

$$x^2 - 14x + 24 = 0$$

$$(x - 2)(x - 12) = 0$$

$$x = \frac{-(-14) \pm \sqrt{(-14)^2 - 4(1)(24)}}{2(1)}$$

$$x = \frac{14 \pm \sqrt{196 - 96}}{2}$$

$$x = \frac{14 \pm \sqrt{100}}{2}$$

$$x = \frac{14 \pm 10}{2}$$

$$x = \frac{14 + 10}{2} \quad x = \frac{14 - 10}{2}$$

$$x = \frac{24}{2} \quad x = \frac{4}{2}$$

$$x = 12 \quad x = 2$$