

Question one

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

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

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

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

$$-3x = 34$$

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

ii) ~~$x = -\frac{34}{3}$~~

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

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

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

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

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

$$(3x+1)^2 = (x+3)(x+7)$$

$$x - x = \frac{1+\sqrt{41}}{4} \quad x = \frac{1-\sqrt{41}}{4}$$

$$x = \frac{1+\sqrt{41}}{4}$$

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$$b) i) 8P^3Q^2 - 4P^2Q^3 + 2P^3Q$$

$$8P^2PQQ - 4P^2QQ^2 + 2P^2PQ$$

$$= 4 \cdot 2P^2PQQ + 2 \cdot 2P^2QQ^2 + 2P^2PQ$$

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

$$ii) x^2 - y^2$$

$$(x+y)(x-y)$$

$$c) i) x^2 + 12x + 20 = 0$$

$$x^2 + 12x + 20 = 0$$

$$ii) 2x^2 + x - 15 = 0$$

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iii)

Question Two

i)

Question Three

$$\text{a) i) } \sin x = 0.67$$

$$x = \sin^{-1}(0.67) + 2\pi n, x = \pi - \sin^{-1}(0.67) + 2\pi n$$

$$(x = 0.73420 + 2\pi n, x = \pi - 0.73420 + 2\pi n)$$

$$\text{ii) } \tan^2 x - 7 \tan x + 10 = 0$$

$$\tan x = 5, \tan x = 2$$

$$x = \tan^{-1} 5 + \pi n, x = \tan^{-1} 2 + \pi n$$

$$(x = 1.37340 + \pi n, x = 1.10714 + \pi n)$$

Question Four

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

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

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

$$y = 16x^2 + 12x - 16$$

$$y = -11x^2 - 30$$

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Question Five

a) i) ~~$z_1 + z_2$~~
 $(3+7j) + (2-10j)$

$7j - 10j + 3 + 2$

$7j - 10j + 5$
 $(= -3j + 5)$

ii) $z_1 - z_2$

$3+7j - 2-10j$
 $7j - 10j + 3 - 2$
 $= 7j - 10j + 1$
 $(= -3j + 1)$

iii) $\frac{z_1}{z_2} = \frac{3+7j}{2-10j}$

~~$z_1 z_2$~~ $\frac{7j+3}{-10j+2} = \frac{7}{10} + \frac{22}{5} \frac{-10j+2}{-10j+2}$

$= -\frac{7}{10} + \frac{11}{5}(-5j+1)$

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b) $7x^2 = -2x - 11$

$7x^2 + 11 = -2x$

$7x^2 + 2x + 11 = 0$

~~$x = \frac{-2 \pm \sqrt{4 - 4 \cdot 7 \cdot 11}}{2 \cdot 7}$~~

$x_{1/2} = \frac{-2 \pm \sqrt{4 \cdot 19i}}{2 \cdot 7}$

$x_1 = \frac{-2 + 4\sqrt{19i}}{2 \cdot 7} \quad x_2 = \frac{-2 - 4\sqrt{19i}}{2 \cdot 7}$

oder $x = \frac{-2 + 4\sqrt{19i}}{2 \cdot 7} = \frac{1}{7} + i \frac{2\sqrt{19}}{7}$

$x = \frac{-2 - 4\sqrt{19i}}{2 \cdot 7} = \frac{1}{7} - i \frac{2\sqrt{19}}{7}$

$x = -\frac{1}{7} + i \frac{2\sqrt{19}}{7} \quad x = -\frac{1}{7} - i \frac{2\sqrt{19}}{7}$

c) $(5+3j)^4$