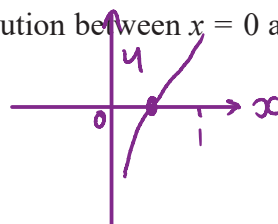1. (a) Show that the equation $x^3 + 7x - 5 = 0$ has a solution between $x = 0$ and $x = 1$

When $x = 0$

$$(0)^3 + 7(0) - 5$$

$$= -5$$

When $x = 1$

$$1^3 + 7(1) - 5$$

Therefore, because one of the values is negative and one of the values is positive ✓

(2)

(b) Show that the equation $x^3 + 7x - 5 = 0$ can be arranged to give $x = \dfrac{5}{x^2 + 7}$

$$x^3 + 7x - 5 = 0$$

$$x(x^2 + 7) - 5 = 0 \;✓$$
$$\qquad (+5) \qquad (+5)$$

$$x(x^2 + 7) = 5$$

$$(\div (x^2 + 7))$$

$$x = \frac{5}{x^2 + 7} \;✓$$

(2)

(c) Starting with $x_0 = 1$, use the iteration formula $x_{n+1} = \dfrac{5}{x_n^2 + 7}$ three times to find

an estimate for the solution of $x^3 + 7x - 5 = 0$

$$x_1 = \frac{5}{x_0^2 + 7}$$

$$x_1 = \frac{5}{1^2 + 7}$$

$$= 0.625 \;✓$$

$$x_2 = \frac{5}{x_1^2 + 7}$$

$$x_2 = \frac{5}{(0.625)^2 + 7}$$

$$= 0.67653277$$

$$x_3 = \frac{5}{x_2^2 + 7}$$

$$x_3 = \frac{5}{(0.67653277)^2 + 7}$$

$$= 0.670448 \;✓$$

0.670448 ✓

(3)

(d) By substituting your answer to part (c) into $x^3 + 7x - 5$,
comment on the accuracy of your estimate for the solution to $x^3 + 7x - 5 = 0$

Answer to part c) = 0.670 448

$(0.670448)^3 + 7(0.670448) - 5 = -0.0054948$

Estimate is accurate because the substitution gives us a value close to 0

(2)

(Total for Question   is 9 marks)

← UB

← LB

Litres of Petrol
11.489 ——Round——→ 11.85

Kilometres Travelled
LB = 147.5

UB = 11.85

Petrol Consumption = $\dfrac{100 \times 11.85}{147.5}$

= 8.0339

Yes, Nathan could be wrong, because the
maximum petrol consumption is 8.0339

$$\frac{3^? \times 3^{-?}}{3^3}$$

$$= \frac{3^{7-2}}{3^3}$$

$$= \frac{3^5}{3^3}$$

$$= 3^{5-3}$$

$$= 3^2$$

$$= 9$$

$a^x \times a^y = a^{x+y}$

$\dfrac{a^x}{a^y} = a^{x-y}$

9 ✓

2. $v^2 = u^2 + 2as$

$u = 12 \quad a = -3 \quad s = 18$

(a) Work out a value of v.

$$v^2 = (12)^2 + 2(-3)(18)$$ ✓
$$v^2 = 144 + 2(-54)$$
$$v^2 = 144 - 108$$
$$v^2 = 36$$
$$v = \pm 6$$

± 6 ✓

(2)

(b) Make s the subject of $v^2 = u^2 + 2as$

$$v^2 = u^2 + 2as$$
$$(-u^2) \quad (-u^2)$$ ✓
$$v^2 - u^2 = 2as$$
$$(\div 2a) \quad (\div 2a)$$
$$\frac{v^2 - u^2}{2a} = s$$

$s = \dfrac{v^2 - u^2}{2a}$ ✓

(2)

(Total for Question   is 4 marks)

3. The number of days, *d*, that it will take to build a house is given by

$$d = \frac{720}{n}$$

where *n* is the number of workers used each day.

Ali's company will take 40 days to build the house.
Hayley's company will take 30 days to build the house.

Hayley's company will have to use more workers each day than Ali's company.

How many more?

Ali's Company: $n \times 40 = \frac{720 \times n}{n}$

$$\frac{40n}{40} = \frac{720}{40}$$

$$n = 18$$

Hayley's Company: $n \times 30 = \frac{720 \times n}{n}$ ①

$$\frac{30n}{30} = \frac{720}{30}$$

$$n = 24$$

$$24 - 18 = 6$$ ①

① 6