

Q.1 $\sqrt{7+\sqrt{7+\sqrt{7+\dots}}}$

→ Let

$$\sqrt{7+\sqrt{7}} = x$$

Squaring both sides

$$7 + \sqrt{7+x} = x^2$$

$$\sqrt{7+x} = x^2 - 7$$

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

$$7+x = x^4 - 7x^2 + 49$$

$$x^4 - 7x^2 - x + 42 = 0$$

Q.2 $7x^2 - 6y^2 = -11x^2 - 4y^2$

$$7x^2 + 11x^2 = -4y^2 + 6y^2$$

$$18x^2 = 2y^2$$

$$\frac{x^2}{y^2} = \frac{2}{18}$$

$$\left(\frac{x}{y}\right)^2 = \frac{1}{9}$$

$$\boxed{\frac{x}{y} = \pm \frac{1}{3}}$$

Q.3 $x + 3y = 4$

$$x^2 + y^2 - 4y = 12 \dots \textcircled{1}$$

$$x = 4 - 3y \dots \textcircled{2}$$

putting value of x in $\textcircled{1}$

$$(4-3y)^2 + y^2 - 4y = 12$$

$$16 + 9y^2 - 24y + y^2 - 4y = 12$$

$$10y^2 - 28y + 4 = 0$$

$$5y^2 - 14y + 2 = 0$$

$$y = \frac{14 \pm \sqrt{196 - 4 \times 5 \times 2}}{10}$$

$$y = 2.6489 \quad \text{or} \quad y = 0.1510$$

Q.4

a) $d(3.5)^2 - 16(3.5) + 34$

$d = 2.5$ (millions of particles per cubic foot)

b) $\frac{d}{dx}(d) = 4x - 16 \Rightarrow x = 4$ when $\frac{d}{dx} = 0$

$$\frac{d^2}{dx^2}(d) = 4$$

$\therefore$ minimum $x = 4$ per min. (in hundred)

c) $100 = 2x^2 - 16x + 34$

$$0 = 2x^2 - 16x - 66$$

$$x = \frac{16 \pm \sqrt{256 + 528}}{2}$$

$$x = 2200 \quad \text{or} \quad x =$$

$$x = \frac{16 \pm \sqrt{256 + 528}}{4}$$

$$\underline{x = 11} \quad \text{or} \quad x \neq -3$$

$\therefore x = 11$ as speed cannot be negative.

5

1) Company 1 :- $1500 + 25x > 0$
 2) Company 2 :- $2100 + 22y > 0$

$$1500 + 25x < 2100 + 22x$$

$$3x < 600$$

$$\underline{x < 200}$$

$$x^3 - 7x^2 + 14x - 6 = 0$$

1) $[0, 1]$

a	b	t	f(t)
0	1	1.5	2.625
0	1.5	0.75	0.984375
0	0.75	0.375	-1.68164
0.375	0.75	0.5625	0.16186
0.5625	0.75	0.65625	0.45547

$[1, 3.2]$

a	b	t	f(t)
3.2	1	2.1	1.791
3.2	2.1	2.65	0.55215
3.2	2.65	2.925	0.8582
3.2	2.925	3.0625	-0.0544

c) [3.2, 4]

a	b	t	f(t)
3.2	4	3.6	0.336
3.2	3.6	3.4	-0.016
3.4	3.6	3.5	0.125
3.4	3.5	3.45	0.046125 0.046125
3.4	3.45	3.425	0.01302
3.4	3.425	3.4125	-1.99×10^{-3}
3.4125	3.4125	3.4125	5.35×10^{-3}
3.4125	3.41875		

Q.7 $f(x) = 230x^4 + 18x^3 + 9x^2 - 221x - 9$

$f'(x) = 920x^3 + 54x^2 + 18x - 221$

i) [-1, 0]

$x_1 = 0$

$$x_{n+1} = x_n - \frac{f(x_n)}{f'(x_n)}$$

$$x_2 = 0 - \frac{(-9)}{-221} \Rightarrow -0.040723$$

$$x_3 = -0.040 \Rightarrow -0.0409288$$

$$x_4 = -0.04065 \Rightarrow -0.04065988$$

ii) Same as above

$$\frac{70 + 86 + 81 + 83 + x}{5}$$

$$90 > \frac{320 + x}{5} \geq 80$$

$$450 > 320 + x \geq 4$$

$$130 > x \geq 80$$

$$x_1 = 4\%, y_1 = 8.54$$

$$x_2 = 20\%, y_2 = -11.81$$

$$\frac{x - 4}{20 - 4} = \frac{0 - 8.54}{-11.81 - 8.54}$$

$$\Rightarrow \boxed{x = 10.71\%}$$

$$R(x) = 32x - 0.21x^2$$

$$C(x) = 195 + 12x$$

$$\text{As, } R(x) - C(x) = \text{Profit,}$$

$$R(x) - 32x -$$

$$f(x) = 32x - 0.21x^2 - 195 - 12x$$

$$-0.21x^2 + 20x - 195 = 0$$

$$0.21x^2 - 20x + 195 = 0$$

$$x = \frac{20 \pm \sqrt{(-20)^2 - 4(0.21)(195)}}{2 \times 0.21}$$

$$x = \cancel{84.2} 84.2114 \quad \text{or} \quad x = 11.0266$$

$$f'(x) = 0.42x - 20 > 0$$

$$0.42x > 20$$

$$x > 47.61$$

as order should be more than 47.61

$$\underline{\underline{x = 84.2114.}}$$