

Assignment 1

1) $\sqrt{7 + \sqrt{7 + \sqrt{7} \dots}}$

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

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

$$\Rightarrow x^2 = 7 + x$$

$$\Rightarrow x^2 - x - 7 = 0$$

$$a = 1, b = -1, c = -7$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$= \frac{1 \pm \sqrt{1 + 28}}{2}$$

$$x = \frac{1 \pm \sqrt{29}}{2}$$

$$x = \frac{1 + \sqrt{29}}{2}, \quad \frac{1 - \sqrt{29}}{2}$$

PAGE No.	
DATE	/ /

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

$$\Rightarrow 18x^2 = 2y^2$$

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

$$\Rightarrow \frac{x^2}{y^2} = \frac{1}{9}$$

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

3)

$$x + 3y = 4$$

$$x = 4 - 3y$$

$$x^2 + y^2 - 4y = 12$$

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

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

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

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

$$a = 5, b = -14, c = 2$$

$$y = \frac{14 \pm \sqrt{196 - 40}}{10} = \frac{14 \pm \sqrt{156}}{10}$$

$$= \frac{14 + 2\sqrt{39}}{10}, \frac{14 - 2\sqrt{39}}{10}$$

$$\Rightarrow y = \frac{7 + \sqrt{39}}{5}, \frac{7 - \sqrt{39}}{5}$$

$$x = 4 - 3y$$

$$\therefore x = 4 - 3\left(\frac{7 + \sqrt{39}}{5}\right)$$

$$\text{or } x = 4 - 3\left(\frac{7 - \sqrt{39}}{5}\right)$$

$$4) d = 2x^2 - 16x + 34$$

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

$$= 7 - 56 + 34$$

$$d = -15 \text{ m/f}^3$$

$$b) d' = 4x - 16 = 0$$

$$\Rightarrow 4x = 16$$

$$\Rightarrow x = \frac{16}{4}$$

$$\Rightarrow \boxed{x = 4}$$

$$d'' \neq 0$$

4 rpm for min. smoke

Minimum output =

$$= 2 \times 16 - 16 \times 4 + 34$$

$$= 2 \text{ m/f}^2$$

c) $d = 100 \text{ m/f}^3$

$$d = 2x^2 - 16x + 34$$

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

$$\Rightarrow 50 = x^2 - 8x + 17$$

$$\Rightarrow x^2 - 8x - 33 = 0$$

$$\Rightarrow x^2 - 11x + 3x - 33 = 0$$

$$\Rightarrow x(x - 11) + 3(x - 11) = 0$$

$$\Rightarrow (x + 3)(x - 11) = 0$$

$$\Rightarrow x = -3, 11$$

x can't be negative

$\therefore$ Speed of engine = 11,000 rpm

5) a) $C1 = 1500 + 25n$

b) $C2 = \cancel{212100} + 22n \quad 2100 + 22n$

c) $n \geq 25$
 $2100 + 22n < 1500 + 25n$

$$600 < 3n$$

$$200 < n$$

d) For $n \geq 200 \rightarrow C2$
 $n < 200 \rightarrow C1$

e)

x	y
4%	8.54
20%	-11.81

Required $y = 0$

~~$x = 4\% + \frac{20.35}{16\%} (7.9\%)$~~

$$x = x_1 + (y - y_1) \frac{(x_2 - x_1)}{(y_2 - y_1)}$$

$$= 4\% + (-8.54) \frac{16\%}{20.35}$$

$$x = 10.71\%$$

1) $f(x) = x^3 - 7x^2 + 14x - 6$
 a) $[0, 1]$

a	b	f(a)	f(b)
0	1	-6	2
0.5	1	-0.625	2
0.5	0.75	-0.625	0.984375
0.5	0.625	-0.625	0.259766
0.5625	0.625	-0.16187	0.259766
0.578125	0.59375	-0.16187	0.054047
0.578125	0.585938	-0.005262	0.601031
0.582031	0.585938	-0.02572	0.001031

b) $[1, 3.2] = \underline{0.583984}$

a	b	f(a)	f(b)
1	3.2	2	-0.112
1.1	3.2	1.731	-0.112
2.65	3.2	0.552125	-0.112
2.925	3.2	0.085828	-0.112
2.925	3.0625	0.085828	-0.05447
2.99375	3.0625	0.006328	-0.02652
2.99375	3.010938	0.006328	-0.0107
2.99375	3.002578	0.006328	0.00233

c) $[3.2, 4]$

a	b	f(a)	f(b)
3.2	4	-0.112	2
3.2	3.6	-0.112	0.336
3.4	3.6	-0.016	0.336
3.4	3.5	-0.016	0.125
3.4	3.45	-0.016	0.046425
3.4	3.425	-0.016	0.0130125
3.4125	3.425	-0.002	0.0130125
3.4125	3.41875	-0.002	0.00532
3.4125	3.415625	-0.002	-0.0004

$= 3.4141$

7) $f(x) = 230x^4 + 18x^3 + 9x^2 - 221x - 1$

Intervals $[-1, 0]$ $[0, 1]$

Midpoint of $[-1, 0]$ $p_0 = -\frac{1}{2}$

Midpoint of $[0, 1]$ $p_0 = \frac{1}{2}$

$p_4 = -0.040659288$ for the interval $[-1, 0]$

$p_6 = -0.040659288$ for $[0, 1]$

for $p_0 = -0.5$

we have,

$$p_5 = -0.04$$

Ans for $p_0 = 0.5$

~~we~~ we get,

$$p_{21} = 0.96$$

Q8 Let no. scored in 5th examination is x

$$\begin{aligned} \text{average} &= \frac{70 + 86 + 81 + 83 + x}{5} \\ &= \frac{320 + x}{5} \end{aligned}$$

According to condition,

$$(i) \quad \frac{320 + x}{5} \geq 88$$

$$\begin{aligned} 320 + x &\geq 440 \\ x &\geq 120 \end{aligned}$$

$$(ii) \quad \frac{320 + x}{5} < 90$$

$$320 + x < 450$$

$$x < 130$$

$$\therefore 120 \leq x < 130$$

Q90

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

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

$$\begin{aligned} \text{Profit} &= R(x) - C(x) \\ &= 32x - 0.21x^2 - 195 - 12x \\ &= 20x - 0.21x^2 - 195 \end{aligned}$$

$$\text{Profit} = 20x - 0.21x^2 - 195$$

Differentiating wrt x ,

$$20 - 0.42x$$

Equating with 0,

$$20 - 0.42x = 0$$

$$20 = 0.42x$$

$$\Rightarrow x = \frac{20}{0.42}$$

$$\Rightarrow \boxed{x = 47.62 \text{ units}}$$