QUESTION 1

1.1.1 $f(-1) = 2(-1)+3$
$= 1$ (2) ✔ substitution ✔ correct answer

1.1.2 $2x + 3 = -1$
$\therefore x = -2$. (2) ✔ correct statement ✔ answer

1.2 $2x^2 - 6x - 1 = 0$ ✔ standard form

$$x = \frac{6 \pm \sqrt{36 - 4(2)(-1)}}{4}$$ ✔ substitution

$$= \frac{6 \pm \sqrt{44}}{4}$$ ✔ simplification

$= 3{,}16$ *or* $-0{,}16$ (5) ✔ ✔ one each answer

1.3 $y+2 = 2x$ ..... (1)
$y = 2x - 2$ ✔ solve y in (1)

Substitute in $2x^2 = 2 - y^2$

$\therefore 2x^2 = 2 - (2x - 2)^2$ ✔ substitute y in (2)

$= 2 - (4x^2 - 8x + 4)$ ✔ finding product

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

$\therefore 6x^2 - 8x + 2 = 0$ or $3x^2 - 4x + 1 = 0$ ✔ simplification

$\therefore (3x - 1)(2x - 2) = 0$ ✔ factorization

$\therefore x = \frac{1}{3}$ *or* $x = 1$ ✔ for both x values

$\therefore y = -1\frac{1}{3}$ or $y = 0$ (8) ✔ ✔ for each y

[17]

QUESTION 2

2.1 $10x^2 - x - 2 = 0$

$\therefore \Delta = b^2 - 4ac$ ✔ know to use delta

$= 1 + 80$

$= 81$ ✔ substitution

Roots are rational and unequal (4) ✔ rational ✔ unequal

2.2.1 $3x^2 - 4x + p = 0$

$\Delta = b^2 - 4ac$

$= 16 - 12p$

For non - real roots $\Delta < 0$

$16 - 12p < 0$

$p > \frac{4}{3}$

- ✔ know delta
- ✔ correct substitution
- ✔ ✔ correct statement about delta

(6)

- ✔ $\frac{4}{3}$ ✔ > sign

2.2.2 p=1

(2)

- ✔ ✔ answer

[12]

QUESTION 3

3.1.1.1 $r^2 = x^2 + y^2$

$= 2^2 + (3)^2$

$= 4 + 9$

$= 13$

$y = \sqrt{13 + x^2}$

- ✔ substitution
- ✔ answer = 13

(3)

- ✔ form of equation

3.1.1.2 $xy = k$

$k = 2(3) = -8$

- ✔ format
- ✔ k = (2)(3)

(2)

3.1.2 B(3; 2)

(1)

- ✔ answer

3.2 Say function is $f(x) = mx + c$

$f(0) = m(0) + c = -3 \quad \therefore c = -3$

and $f(1) = m(1) - 3 = 0 \quad \therefore m = 3$

- ✔ substitute, $f(0) = -3$
- ✔ c = –3
- ✔ substitute(1) = 0
- ✔ m = 3

Equation: y = 3x - 3

OR

x/c: (1; 0) ✔

y/c: (0; -3) ✔

$m = \frac{-3}{-1} = 3$ ✔ ✔ $\therefore y = 3x - 3$ ✔

(5)

- ✔ answer

3.3.1

Turning point: (1;–4) ✔ answer

and $(x-1)^2-4 = x^2-2x+1-4$

$= x^2-2x-3$ ✔ expanding

$= (x-3)(x+1) = 0$ ✔ factorization

$x = 3$ or $x = -1$ ✔ both values of x

OR

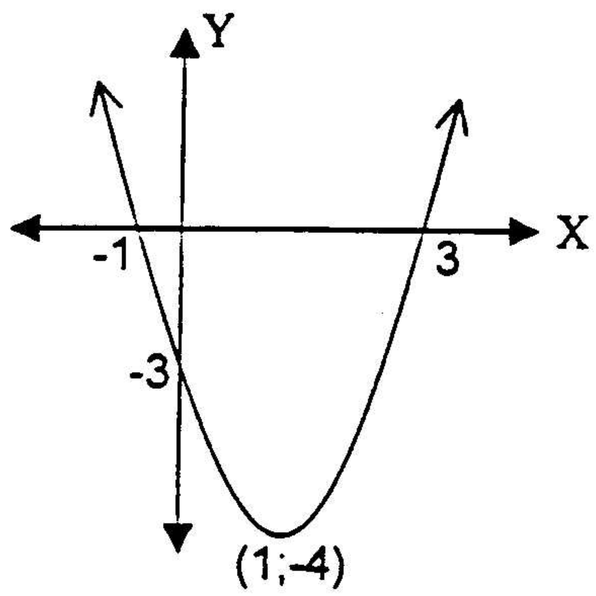
$(x-1)^2-4 = 0$

$(x-1)^2 = 4$

$x-1 = \pm 2$

$x = 3$ *or* -1

Cut y-axis –3



✔ x intercepts
✔ y intercept
✔ turning point

(7)

3.3.2 $x \leq -1$ or $x \geq 3$ (2) ✔ $x \leq -1$ ✔ $x \geq 3$

[20]

QUESTION 4

4.1 x – a is a factor of f(x) ✔ correct answer
OR
a is a root of *f(x)*

(1)

4.2 $f(x) = 2x^3-3x^2+kx-4$

$f(-1) = 4$

$4 = 2(-1)^3-3(-1)^2+k(-1)-4$ ✔ subs $x = -1$, ✔ $f(-1) = 4$

$k = -13$ ✔ simplification
✔ answer – 13

(4)

4.3.1 $f(x) = x^3 - 12x - 16$

Put $f(-2) = -8 + 24 - 16 = 0$

$\therefore x + 2$ is a factor

(2) ✔ get f(-2) ✔ get = 0

4.3.2 $x^3 - 12x - 16 = (x+2)(x^2 - 2x - 8)$

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

$x = -2$ *or* 4

(4) ✔ ✔ quadratic factor (✔ –2 ; ✔ –8) ✔ linear factors ✔ solutions

[11]

QUESTION 5

5.1 $4^x = \frac{1}{64}$

$(2^2)^x = \frac{1}{2^6}$ *OR* $4^x = \frac{1}{4^3}$

$2^{2x} = 2^{-6}$ *OR* $4^x = 4^{-3}$

$2x = -6$

$x = -3$ *OR* $x = -3$

(3) ✔ same base (2 or 4) ✔ same base 2 or 4 ✔ answer

5.2 $\frac{2.3^x - 3^{x-1}}{5.3^x} = \frac{2.3^x - 3^x.3^{-1}}{5.3^x}$

$= \frac{3^x(2 - 3^{-1})}{5.3^x}$

$= \frac{2 - 3^{-1}}{5} = \frac{2 - \frac{1}{3}}{5.} = \frac{\frac{5}{3}}{5}$

$= \frac{1}{3}$

(5) ✔ breaking up ✔ remove common factor correctly ✔ cancellation CF ✔ $3^{-1} = \frac{1}{3}$ ✔ answer

OR

$\frac{2.3^x - 3^{x-1}}{5.3^x} = \frac{2.3.3^{x-1} - 3^{x-1}}{5.3.3^{x-1}}$

$= \frac{3^{x-1}(6-1)}{15.3^{x-1}}$

$= \frac{5}{15}$

$= \frac{1}{3}$

5.3 $\frac{\sqrt{5}+2}{\sqrt{5}}\cdot\frac{\sqrt{5}}{\sqrt{5}}=\frac{5+2\sqrt{5}}{5}$

OR

$\frac{\sqrt{5}}{\sqrt{5}}+\frac{2}{\sqrt{5}}=1+\frac{2\sqrt{5}}{5}$

✔ multiplying by $\frac{\sqrt{5}}{\sqrt{5}}$
✔ simplify numerator
✔ simplify denominator

(3)

[11]

QUESTION 6

6.1.1 $\log_x 0{,}25 = 2$

$0{,}25 = x^2$

$(0{,}5)^2 = x^2$

$x = \pm 0{,}5$

$x = 0{,}5 (x > 0)$

OR

$x^2 = \frac{1}{4} = (\frac{1}{2})^2$

$x = \frac{1}{2}$

✔ switch from log to exp form
✔ to powers 2/process
✔ answer

(3)

6.1.2 $\log 25 - \log(x-1) = 1$

$\log\frac{25}{(x-1)} = 1 = \log 10$

$\frac{25}{x-1} = 10$

$10x - 10 = 25$

$10x = 35$

$x = \frac{35}{10} = \frac{7}{2}$

✔ log 10 = 1
✔ log laws applied
✔ without logs
✔ simplification
✔ answer

(5)

OR

$\log 25 - \log(x-1) = 1$

$\log\frac{25}{(x-1)} = 1$

$\frac{25}{x-1} = 10^1$

$10x - 10 = 25$

$10x = 35$

$x = \frac{35}{10} = \frac{7}{2}$

✔ correct application
✔ ✔ log to exponent
✔ simplification
✔ answer

6.2 $A = P\left(1+\frac{r}{100}\right)^n$ ✔ formula

$= 375\left(1+\frac{9}{100}\right)^4$ ✔ ✔ ✔ substituting K, r and n

$= 375(1{,}09)^4$

$= 529{,}3431$ ✔ answer calculated

∴ the expenses are R 529 343 100 (6)

✔ answer transferred to monetary terms

[14]

QUESTION 7

7.1 $\sum_{k=1}^{3} a.2^{k-1} = 28$

$a.2^0 + a.2^1 + a.2^2 = 28$ ✔ ✔ expanding correctly

$7a = 28$ ✔ simplification

$a = 4$ (4) ✔ answer

7.2.1 $T_n = a + (n-1)d$ ✔ formula

$T_3 = a + 2d = -7$ ✔ substitution T_3

$T_7 = a + 6d = 9$ ✔ substitution T_7

$4d = 16$

$d = 4$ ✔ d

$a = -15$ (5) ✔ a

7.2.2 $T_{51} = a + 50d$ ✔ substituting in formula

$= -15 + 50(4)$

$= 185$ ✔ answer

(2)

7.2.3 $S_n = \frac{n}{2}(a+l)$ ✔ formula

$= \frac{51}{2}(-15+185)$ ✔ substitution

$= 4335$ (3) ✔ answer

OR

$S_n = \frac{n}{2}[2a+(n-1)d]$

$= \frac{51}{2}[-30+50.4]$

$= 4335$

7.3.1 $a = 1, r = -3$

$T_n = ar^{n-1}$

$T_8 = ar^7$

$= (-3)^7$

$= -2187$

✔ a and r
✔ formula
✔ substitution
✔ answer

(4)

7.3.2 $S_n = \frac{a(r^n - 1)}{r - 1}$

$= \frac{(-3)^8 - 1}{(-3) - 1}$

$= -1640$

✔ formula
✔ substitution
✔ answer

(3)

7.4 a = 280, r = 2, $S_n = 143080$

$S_n = \frac{a(r^n - 1)}{r - 1}$

$\frac{280(2^n - 1)}{2 - 1} = 143080$

$2^n - 1 = 511$

$2^n = 512$

$2^n = 2^9$

$n = 9$

✔ values of a, r and S
✔ formula
✔ simplification
✔ exponential form
✔ answer

(7)

[28]

QUESTION 8

8.1.1 $f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$ ✔ correct substitution

$= \lim_{h \to 0} \frac{-2(x+h)^2 - (-2x^2)}{h}$

$= \lim_{h \to 0} \frac{-2(x^2 + 2xh + h^2) - (-2x^2)}{h}$ ✔ expand (x + h)

$= \lim_{h \to 0} \frac{-2x^2 - 4xh - 2h^2 + 2x^2}{h}$ ✔ brackets removed

$= \lim_{h \to 0} \frac{h(-4x - 2h)}{h}$

$= \lim_{h \to 0} (-4x - 2h)$ ✔ eliminating h

$= -4x$ (5) ✔ answer

8.1.2 $f'(x) = -4x$

$f'(-1) = 4$ ✔ derivative

Gradient is 4 (2) ✔ answer

8.1.3 $\frac{f(3) - f(-1)}{3 - (-1)} = \frac{-2(3)^2 - [-2(-1)^2]}{4}$ ✔ formula ✔ substitution

$= -4$ (3) ✔ answer

8.2.1 $f(x) = 4x^2 - 4x + 1$ ✔ multiply factors

$f'(x) = 8x - 4$ (2) ✔ answer

8.2.2 $y = \sqrt{x} - \frac{2}{x}$

$= x^{\frac{1}{2}} - 2x^{-1}$ ✔ ✔ writing as powers

$\frac{dy}{dx} = \frac{1}{2}x^{-\frac{1}{2}} + 2x^{-2}$ (4) ✔ ✔ finding answers

8.3.1 $f(x) = (x+1)^2(x-1) = 0$ ✔ f(x) = 0

$x = -1\ ;\ 1$ ✔ x values

$BA = 2$ ✔ length BA (3)

8.3.2 $f'(x) = 3x^2 + 2x - 1 = 0$ ✔ derivative

$(3x-1)(x+1) = 0$ ✔ =0

$x = \frac{1}{3}$ or -1 ✔ factors ✔ answers for x

$f(\frac{1}{3}) = (\frac{1}{3})^3 + (\frac{1}{3})^2 - \frac{1}{3} - 1$

$= \frac{1}{27} + \frac{1}{9} - \frac{1}{3} - 1$

$= \frac{-32}{27}\ (-1\frac{5}{27})$ (6) ✔ correct answer for $f\left(\frac{1}{3}\right)$

E is $(\frac{1}{3}; \frac{-32}{27})$ ✔ coordinates E

8.3.3 $3x^2 + 2x - 1 = \frac{5}{3}$ ✔ ✔ derivative = $\frac{5}{3}$

$9x^2 + 6x - 8 = 0$ ✔ standard form

$(3x+4)(3x-2) = 0$ ✔ factorization (5)

$x = -\frac{4}{3}$ or $x = \frac{2}{3}$ ✔ x answer

[30]

QUESTION 9

9.1 $QL = 4 - x$ (1) ✔ answer

9.2 $A = QP^2$ ✔ $A = QP^2$

$= x^2 + (4-x)^2$ ✔ using Pythagoras

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

$= 2x^2 - 8x + 16$ (3) ✔ answer

9.3 $\frac{dA}{dx} = 4x - 8 = 0$ ✔ derivative ✔ =0

$x = \frac{8}{4} = 2$ (3) ✔ get x

[7]

TOTAL: 150