GAUTENG DEPARTMENT OF EDUCATION

PREPARATORY EXAMINATON

PROOFREAD ☐ DATE _____
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MATHEMATICS
(First Paper)

MEMORANDUM

QUESTION 1 [14]

1.1 $x(x+2)=0$
$x=0$ or $x=-2$

1A factorizing
2 CA for each answer
[3]

1.2 $x \le -2$ or $x \ge 0$; with $x>0$

$\therefore x>0$

2CA for each inequality
(-1) if '<' is used
1CA for selecting correct inequality
Full marks for answer only.
[3]

1.3 $x=\dfrac{-(-3)\pm\sqrt{(-3)^3-4(2)(-7)}}{2(2)}$

$x=\dfrac{3\pm\sqrt{65}}{4}$

$x=2.77$ or $x=-1,27$

1A substitution into correct formula

$\frac{2}{3}$ if left in surd form

2CA for each correct answer **[3]**

1.4 $1+2^{x-2}+2^{x+1}+2^x=53$
$2^x(2^{-2}+2+1)=52$

$2^x=16$
$x=4$

1A for $2^0=1$
1A for factorizing
1A for RHS
1CA
1CA **[5]**

QUESTION 2 [10]

2.1.1 $(x+1)^2-4=16$
$(x+1)^2=20$
$x+1=\pm\sqrt{20}$
$x=\pm2\sqrt{5}-1$

1A squaring both sides
1CA for isolating complete square
1M for taking square root
2CA for each answer

OR

$(x+1)^2-4=16$
$x^2+2x-19=0$
$x=\dfrac{-2\pm\sqrt{(2)^2-4(-19)}}{2}$
$x=\pm2\sqrt{5}-1$

1A squaring both sides
1CA simplification
1CA substitution into correct formula
2CA for each answer **[5]**

2.1.2 $k=0$

1A **[1]**

2.2 $\Delta \geq 0$

$(2)^2 - 4(3)(-k+1) \geq 0$

$k \geq \frac{2}{3}$

1M realizing to use $b^2 - 4ac$
1A correct inequality
1A substitution into correct formula

1CA

[4]

QUESTION 3 [8]

3.1 $99 + 97 + 95 + ...101 - 2n$

1M for series (+ signs)
1A for first term
1A for last term

[3]

3.2 $\frac{n}{2}\left[2(99) + (n-1)(-2)\right] = 0$

$200n - 2n^2 = 0$ or $100n - n^2 = 0$
$n(100 - n) = 0$
$n = 100$ (or $n \neq 0$)

1M use of correct formula
1CA correct substitution and equation
1CA for correct simplification
1CA correct factorization
1CA for choosing correct answer **[5]**

QUESTION 4 [17]

4.1.1 $T_{31} = 1$

1A

[1]

4.1.2 Sequence: 1; 5; 9; …….

$S_{16} = \frac{16}{2}\left[2(1) + 15(4)\right]$
$= 496$
$S_{32} = 496 + 16$
$= 512$

1M realizing sum of 16 terms.
1CA substitution into correct formula
1CA
1CA addition of sums

[4]

4.1.3 $2n - 3 > 97$
$n > 50$
$\therefore n = 52$

1CA
1CA
1CA

[3]

4.2.1 second difference: 2
$a = 1$; $b = 4$; $c = -2$

$T_n = n^2 + 4n - 2$

1A finding second difference
1A value of a
1CA value of b
1CA value of c
Any valid method may be used

[4]

4.2.2 $T_{24} = (24)^2 + 4(24) - 2$
$T_{24} = 670$

1 CA correct substitution
1CA

[2]

4.2.3 $S_\infty = \frac{670}{1 - 0,8}$
$= 3\ 350$

1M
1A substitution
1CA **[3]**

QUESTION 5 [16]

5.1 $\left(1+\frac{0,1}{12}\right)^{12}=\left(1+\frac{i^2}{2}\right)^2$ 1A substitution into correct formula

$i^{(2)}=2\left[\sqrt{\left(1+\frac{0.1}{12}\right)^{12}}-1\right]$ 1CA simplification

$i^{(2)}=0,1021$ or $r=10,21\%$ 1CA

[3]

5.2.1 $0,1\times 1200000$ 1M

= R120 000 1A

[2]

5.2.2 $1\ 080\ 000=\frac{x\left(1-\left(1+\frac{0,084}{12}\right)^{-240}\right)}{\frac{0,084}{12}}$ 1A for 1080000
1M correct formula
1A correct substitution

x = R9 304.25 1CA

[4]

5.2.3 Total amount paid = 9 304,25 x 240 + 120 000 2CA

= R2 353 020 1CA

[3]

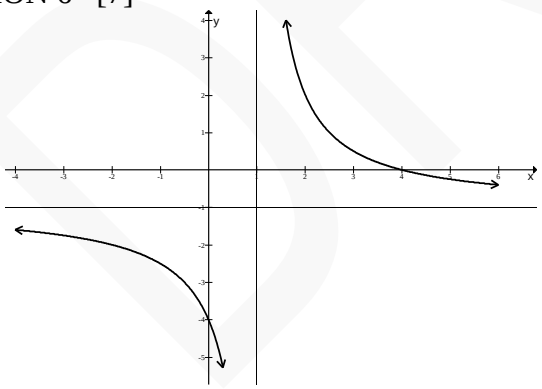
5.3 A = 20 000$(1 – 0,2)^2(1 – 0,18)(1 – 0,16)$ 1M correct formula
2A

A = R8 816,64 1CA
(-1 for incorrect rounding)

[4]

QUESTION 6 [7]

6.1



1A for shape
1A x-intercept (4; 0)
1A y-intercept (0; -4)
1A both asymptotes $y=-1$ and $x=1$

[4]

6.2 $y=-x$ and ($m=-1$ passing through $(1;-1)$) 1A

$y=x-2$ (m = 1; passing through $(1;-1)$) 1A

[2]

6.3 Range: $\mathbb{R}-\{-1\}$ 1A **[1]**

All real values excluding -1.

QUESTION 7 [16]

7.1 $y = a(x-3)^2 + 2$

$-16 = a(0-3)^2 + 2$

$a = -2$

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

1A substitution of turning point

1CA substitution of $(0;-16)$

1CA

[3]

7.2 $0 = -2(x-3)^2 + 2$ or $0 = -2x^2 + 12x - 16$

$(x-4)(x+2) = 0$ (or formula)

$\therefore A(2;0)$ $B(4;0)$

$C(0;-2)$

1 M substituting $y = 0$

1CA

1CA for both A and B

(Full marks for answer only)

1CA

(-1 if not in coordinate form)

[4]

7.3 $y - 0 = 1(x-2)$

$x - y = 2$ or $-x + y = -2$

or

$y = (1)x + c$

$0 = (1)(1) + c$

$x - y = 2$ or $-x + y = -2$

1A for gradient

1CA for correct substitution

1CA

1A for gradient

1CA for substitution

1CA

[3]

7.4 $\frac{-96}{x} = -2x^2 + 12x - 16$

$x^3 - 6x^2 + 8x - 48 = 0$

$(x-6)(x^2+8) = 0$

$x = 6$

$y = -16$

$(6;-16)$

1M

1CA simplification

1CA factorization

1CA

[4]

7.5 $(6;-2)$

2A **[2]**

QUESTION 8 [7]

8.1 $2 = a^{-1}$

1A for substitution

[1]

8.2 $y = log_{\frac{1}{2}} x$ or $y = -log_2 x$

1M use of logs
1A

[2]

8.3 $y = x$

1A

[1]

8.4

at M $\left(\frac{1}{2}\right)^x = x$

1M

$log\left(\frac{1}{2}\right)^x = log\, x$

1M introducing logs

$x\, log\left(\frac{1}{2}\right) - log\, x = 0$

1CA applying log law.

OR

at M $\left(\frac{1}{2}\right)^x = x$

1M

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

1CA into log form

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

1CA applying log law

[3]

QUESTION 9 [15]

9.1.1 $\lim_{h\to 0}\frac{1-3(x+h)^2-(1-3x^2)}{h}$

$=\lim_{h\to 0}\frac{-6xh-3h^2}{h}$

$=\lim_{h\to 0}(-6xh-3h)$

$=-6x$

1A for $f(x+h)$

1A correct substitution into correct formula

1CA simplification

1 CA simplification

1CA

- (-1) for incorrect notation
- Using Rule - $\frac{0}{5}$

[5]

9.1.2 $f'(-2)=-6(-2)$

$=12$

$f(-2)=1-3(-2)^2$

$=-11$

$y+11=12(x+2)$

$y=12x+13$

1A

1A

1CA for finding equation
standard form not needed

[3]

9.2.1 $D_x\left(1-2x^{-\frac{1}{2}}-x^{\frac{1}{2}}+2\right)$

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

2A simplification

2CA

[4

9.2.2 $y=\frac{(p+1)(p^2-p+1)}{p+1}$

$\frac{dy}{dp}=2p-1$

1A factorizing

2CA for each part of final answer

[3]

QUESTION 10 [6]

10.1 $v=3t^2-18t+24$

1A **[1]**

10.2 $\frac{dv}{dt}<0$

$3t^2-18t+24<0$

$(t-4)(t-2)<0$

$2<t<4$

1M

1A for derivative

1CA factorizing

2CA **[5]**

QUESTION 11 [13]

11.1.1 $x^3 - 4x^2 - 11x + 30 = 0$
$(x-5)(x^2 + x - 6) = 0$
$(x-5)(x+3)(x-2) = 0$
$a = -3$ and $b = 2$

1M = 0
1A factors

2CA

If only solved for x: $\frac{2}{4}$

[4]

11.1.2 $3x^2 - 8x - 11 = 0$
$(3x+11)(x+1) = 0$
$c = -1$
$d = 36$

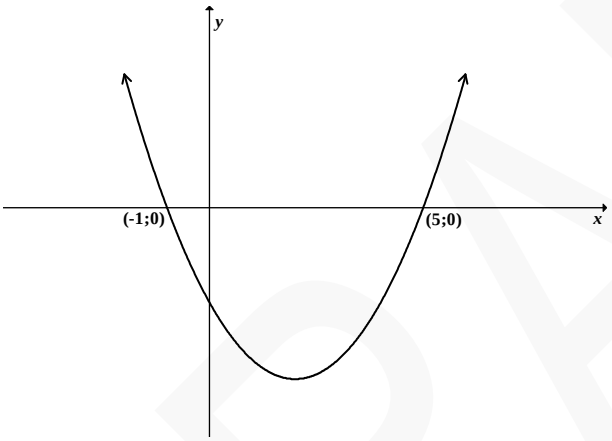
1A derivative = 0
1CA
1CA
1CA

[4]

11.1.3 $x \in (-1\,;\,2)$ or $-1 < x < 2$

1A for values
1A for correct inequality **[2]**

11.2



1A shape
1A x- intercepts (-1 and 5)
1M turning point on correct side

[3]

QUESTION 12 [6]

12.1 $y = -\frac{x}{2} + 9$ 1A

[1]

12.2 $A = \frac{1}{2}xy$ 1A for area formula

$= \frac{1}{2}y(18 - 2y)$ 1CA substitution of x

$= 9y - y^2$

$\frac{dA}{dy} = 9 - 2y = 0$ 1CA

$y = 4\frac{1}{2}$ 1CA

$x = 9 \qquad P(9; 4\frac{1}{2})$ 1CA
Full marks if not in coordinate form

OR

$A = \frac{1}{2}xy$ 1A

$A = \frac{1}{2}x(-\frac{x}{2} + 9)$ 1A substituting for y

$= -\frac{x^2}{4} + \frac{9x}{2}$

$\frac{dA}{dx} = -\frac{1}{2}x + \frac{9}{2} = 0$ 1CA

$x = 9$ 1CA

$y = 4\frac{1}{2} \qquad P(9; 4\frac{1}{2})$ 1CA
Full marks if not in coordinate form. **[5]**

QUESTION 13 [15]

13.1 P(pass Music or Art)

= P(pass Music) + P(pass Art) – P(pass Music and Art) 1M for use of formula

= $0,4 + 0,6 - 0,3$ 1A substitution

= 0,7 or 70% 1CA

Answer only – Full Marks

[3]

13.2 P(Right) x P(Light) = P(Right and Light) 1M

$\frac{48}{60} \times \frac{20}{50} = \frac{a}{60}$

$\frac{4}{15} = \frac{a}{60}$ 1A

$a = \frac{4}{15} \times 60$

$= 16$ 1CA

$b = 4$ 1CA

$c = 32$ 1CA

OR

P(Right) x P(Dark) = P(Right and Dark) 1M

$\frac{48}{60} \times \frac{40}{50} = \frac{c}{60}$

$\frac{8}{15} = \frac{c}{60}$ 1A

$c = 32$ 1CA

$a = 16$ 1CA

$b = 4$ 1CA

OR

P(Left) P(Light) = P(Left) x P(Light) 1M

$\frac{12}{60} \times \frac{20}{50} = \frac{b}{60}$

$\frac{1}{15} = \frac{b}{60}$ 1CA

$b = 4$ 1CA

$a = 16$ 1CA

$c = 32$ 1CA **[5]**

13.3.1 $\frac{9!}{(9-5)!}$ or $9 \times 8 \times 7 \times 6 \times 5$ 1A

= 15120 1A **[2]**

13.3.2 $8 \times 7 \times 6 \times 5 \times 4$ 1A for 4 at the end

1A for 8 x 7 x 6 x 5

= 6720 1CA **[3]**

13.3.3 4^5 1A

= 1024 1A **[2]**