Grade 12 Mathematics: Memorandum Paper 1

1.1.1 $x = 9$ ✓ 1

1.1.2 $x = 27$ ✓ 1

1.1.3 $2x \quad 1 = 0$ ✓

$x = \frac{1}{2}$ ✓ 2

1.2 $6 + 8 + 10 + 12 + 14 = 50$ ✓ ✓ 2

1.3 $S_5 \quad \frac{5}{2}(1 \quad 5) = 15$ ✓

$S_4 \quad \frac{4}{2}(1 \quad 4) = 10$ ✓

$T_5 \quad 15 \quad 10 = 5$ ✓ 3

1.4 a = 64 and r = 1,5 ✓ ✓

$T_7 \quad 64(\frac{3}{2})^6 = 729$ ✓ 3

1.5 $2 = (1{,}087)^n$ ✓

$n = \log_{1{,}087} 2 = 8{,}3$ ✓

Thus during the 9th year ✓ 3

1.6 $f(x) \quad x^2(x \quad 1) \quad 4(x \quad 1) =$ ✓

$(x \quad 1)(x \quad 2)(x + 2) =$ ✓

Thus $x = 1$ or $x = 2$ or $x = -2$ ✓ ✓ 4

1.7.1 $x = 5$ ✓ 1

1.7.2 y- intercept is $y = -0{,}2$ ✓ 1

1.7.3 $x - 5 = -1$ ✓

Thus $x = 4$ ✓ 2

1.7.4 $y = x - 5$ OR $y = -x + 5$ ✓ ✓ 2

1.8 $x = 2y - 4$ ✓

Thus $y = (x + 4)/2$ ✓

Thus $f(x) \quad \frac{x}{2} + 2$ ✓ 3

1.9 C ✓ ✓ 2

1.10 $f(x) = x^3$ ✓ ✓ (may include a constant) 2

1.11 Distance = $\frac{1}{4} \quad 60 \quad \frac{3}{4} \times 80$ ✓ ✓

= 15 + 60 = 75 km ✓ 3

2.1 $100\,000 = 5\,000(1{,}15)^t$ ✓ ✓

$\therefore 20(1{,}15)^t$

$t = 21{,}43$ ✓

Thus 21 hours and 26 minutes ✓ 4

2.2.1 $S_8 = \frac{a\left(1 - r^n\right)}{1 - r}$

$S_8 = \frac{10\left(1 - \frac{1}{2}^8\right)}{1 - \frac{1}{2}} \quad 20\left(1 - \frac{1}{2}^8\right)$ ✓ ✓ ✓

= 19,92 3

2.2.2 $|S_\infty \quad S_n| =$

$\left|\frac{10}{1 - \frac{1}{2}} - \frac{10\left(1 - \left(\frac{1}{2}\right)^n\right)}{1 - \frac{1}{2}}\right|$ ✓

$\left|20 \quad 20\left(1 - \left(\frac{1}{2}\right)^n\right)\right|$

$\therefore 20\left(\frac{1}{2}\right)^n < 0{,}01$

$\therefore \left(\frac{1}{2}\right)^n < 0{,}0005$ ✓ ✓ ✓

$n > \frac{\log 0{,}0005}{\log 0{,}5}$

$n > 10{,}966$

$n = 11$ 4

2.3 From AP:

$b - a = (a - b) - b$ ✓

$\therefore 3b = 2a$

$\therefore b = \frac{2}{3}a$ ✓

From GP:

$\frac{a - b}{a} = \frac{1}{a - b}$ ✓

$\therefore (a - b)^2 = a$

$\therefore (a - \frac{2}{3}a)^2 = a$ ✓

$\therefore (\frac{1}{3}a)^2 = a$

$\therefore \frac{1}{9}a^2 - a = 0$

$\therefore a^2 - 9a = 0$

$\therefore a(a - 9) = 0$ ✓

$\therefore a = 0$ or $a = 9$

$\therefore b = \frac{2}{3} \times 9$

$\therefore b = 6$ ✓ 6

2.4 $3! \; 4! \; 5! \quad 3!(1 \quad 4 \quad 4 \times 5) = 14$ ✓

= 150 ✓ 3

3.1.1 Net salary = $0{,}75 \times 8250 = R6187{,}50$ ✓ 1

3.1.2 Bond repayments:

$0{,}3 \times 6187{,}50 = R1856{,}25$ ✓ 1

3.1.3 $i = \frac{0.135}{12}$ ✓

$n = 20 \times 12 = 240$ ✓

$A = 1\,856.25\left(\frac{1 \quad (1 + i)^n}{i}\right)$ ✓

$A = R\,153\,742{,}66$ ✓ ✓

Thus you can afford the flat. ✓ 6

3.2 $i = \frac{0.1}{12}$ ✓

$20000 = 300\left(\frac{(1+i)^n - 1}{i}\right)$ ✓

$(1+i)^n = \frac{14}{9}$ ✓

$\therefore \log_{(1+i)} \frac{14}{9} = n$ ✓

Thus n = 53,2 months

Thus need 54 months ✓ 5

4.1.1 $f(0) = a \cdot b^0 = 2$ ✓

$a = 2$

$f(1) = 2b^1 = 6$ ✓

$b = 3$

$f(x) = 2.3^x$ ✓ 3

4.1.2 $g(0) = a \cdot b^0 = 2$ ✓

$a = 2$

$g(2) = 2b^2 = 17$

$b^2 = 8{,}5$ ✓

$b = 2{,}92$

$g(x) = 2.(2{,}92)^x$ 3

4.1.3 $f(2{,}3) = 25{,}03$

$f(6) = 1458$ ✓

$g(2{,}3) = 23{,}52$

$g(6) = 1239{,}72$ ✓ 2

4.1.4 $f(x)$ ✓ is the closer approximation as the values of $f(2{,}3)$ and $f(6)$ are closer to the collected data than those of $g(2{,}3)$ and $g(6)$. ✓ 2

4.2.1 $f(x) = (x+3)(x+1) = 0$ ✓

$x = -3$ ✓ or $x = -1$ ✓ 3

4.2.2 E = 3 – 6 = – 3 E (0 ; -3) ✓ 1

4.2.3 $g(x) = (x^2+4x+3)(2x-1)$ ✓

$g(x) = 2x^3+7x^2+2x-3$ ✓✓ 3

4.2.4 $(x^2+4x+3) = (x^2+4x+3)(2x-1)$ ✓

$\therefore (2x-1-1)(x^2+4x+3) = 0$ ✓

$\therefore x = 1$ ✓

$\therefore K(1; 8)$ ✓ 4

4.2.5 $g'(x) = 6x^2+14x+2 = 0$ ✓

$x = \frac{-7 \pm \sqrt{37}}{6}$ ✓

$x = -2{,}18$ or $x = -0{,}15$ ✓

Axis of symmetry of $f(x)$ is x = -2 ✓

Thus F does not lie on the axis of symmetry of $f(x)$. ✓ 5

4.2.6 $f'(x) = g'(x)$ ✓

$2x+4 = 6x^2+14x+2$ ✓

$6x^2+12x-2 = 0$ ✓

$3x^2+6x-1 = 0$

$x = \frac{-6 \pm \sqrt{36-4(3)(-1)}}{6}$ ✓

$\therefore x = 0.15$ ✓ or $x = -2.15$ ✓ 6

5.1 Line 5 ✓

Can't ÷ by (a – b) because a – b = 0 ✓ ✓ 3

5.2.1 $f(x) = (x-2)(2x^2+5x+3) = 0$ ✓

By factor theorem or inspection

$f(x) = (x-2)(2x+3)(x+1) = 0$ ✓

$\therefore x = 2$ ✓ or x = -1,5 ✓ or x = -1 ✓ 5

5.2.2 $x-2 = 2$ $x = 4$

Thus $x-2 = -1{,}5$ thus $x = 0{,}5$ ✓ ✓ ✓

$x-2 = -1$ $x = 1$ 3

6.1 $f'(x) = \lim_{h\to 0} \frac{f(x+h)-f(x)}{h}$ ✓

$\therefore f'(x) = \lim_{h\to 0} \frac{\frac{1}{x+h-2} - \frac{1}{x-2}}{h}$ ✓

$\therefore f'(x) = \lim_{h\to 0} \frac{(x-2)-(x+h-2)}{(x-2)(x+h-2)h}$ ✓

$\therefore f'(x) = \lim_{h\to 0} \frac{-1}{(x-2)(x+h-2)}$ ✓

$\therefore f'(x) = \frac{-1}{(x-2)^2}$ ✓ 5

6.2 $y = x^2 + 2x^{-0.5} - 3x^{-1}$ ✓ ✓

$\frac{dy}{dx} = 2x - x^{-1.5} + 3x^{-2}$ ✓ ✓ ✓ 5

6.3.1 $f'(0) = 2$ thus gradient of tangent is 2 ✓ 1

6.3.2 Increasing implies that $f'(x) > 0$ ✓

$-x^2 - x + 2 > 0$ ✓

$(x+2)(x-1) < 0$

$\therefore -2 < x < 1$ ✓ ✓ 4

6.4.1 $3 = 2m + c$ ✓

$\therefore c = 3 - 2m$ ✓ 2

6.4.2 $y = mx + (3-2m)$

Thus x – intercept is when y = 0 ✓

$x = -\frac{3-2m}{m}$ ✓ 2

6.4.3 Area = 0,5 (x-intercept)(y-intercept) ✓

$= \frac{1}{2}\left(-\frac{3-2m}{m}\right)(3-2m)$ ✓ 2

6.4.4 Multiply out above expression to get

Area = $-\frac{9}{2}m^{-1} + 6 - 2m$ ✓

Thus $\frac{dA}{dx} = \frac{9}{2m^2} - 2 = 0$ ✓

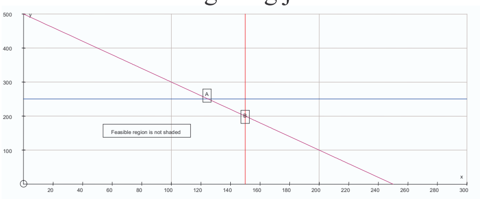
$m^2 = \frac{9}{4}$ ✓

$m = \pm\frac{3}{2}$ ✓

But m < 0 thus $m = \frac{-3}{2}$ ✓ 5

7.1 Twice as much labour as bootleg, thus
500 ÷ 2 = 250 straight leg jeans. ✔ 1

7.2



$x \leq 150$ ✔

$y \leq 250$ ✔

$2x + y \leq 500$ ✔

Correct feasible region ✔ ✔ 5

7.3 $P = 8x + 5y$ ✔

Point A (125; 250) ✔ and B(150 ; 200) ✔
By substituting points into profit function
get maximum profit at A ✔ = R 2 250 ✔ 5

7.4 $P = 11x + 5y$ ✔

Thus to maximize profit now use point B
(by substitution)
Thus 150 straight leg and 200 bootleg ✔ 2