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Test

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Start: 08:09

End:

Surprise Test

1. $|0.1x^2 - 2x + 3| < \log_{10} x$ M1

Using GDC

$\approx 1.525$

1st intersection point: 1.524642729

2nd intersection point: 1.78518627

$\approx 1.785$ A1A1

$1.525 < x < 1.785$ A1

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2.

$u_1 = 50$

$u_4 = 50 \cdot r^3$ A1

$\sqrt[3]{\frac{86.4}{50}} = r$

$r = 1.2$ A1

$S_n = \frac{u_1(r^n - 1)}{r - 1}$

$S_n = \frac{50(1.2^n - 1)}{0.2} = 33500$ A1

$1.2^n = 135$ M1

$n = 26.90\ldots$

Smallest value of $n$ such that $S_n > 33500$

↳ $n = 27$ A1

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3.

a) $u_1 = S_1$

$S_1 = \frac{2}{3} \cdot \frac{7}{8}$ M1

$= \frac{14}{24}$

$= \frac{7}{12}$ A1

b) $S_\infty = \frac{u_1}{1-r}$

$r = \frac{7}{8}$ A1

$S_\infty = \frac{\frac{7}{12}}{1-\frac{7}{8}}$ M1

$= \frac{7}{\cancel{12}_{3}} \cdot \cancel{8}^{2}$

$= \frac{14}{3}$ A1

c)
$$\frac{14}{3} - \frac{\frac{7}{12}\left(1-\left(\frac{7}{8}\right)^{n}\right)}{\left(1-\frac{7}{8}\right)} = 0.001$$
M1

$n = 63.267522$ M1

$S_\infty - S_{63}$ ~~= 0.001~~ $= 0.001036 > 0.$ A1

$S_\infty - S_{64} = 0.000906 < 0.001$

$n = 64$ A1

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4.

a)
$$r = \frac{\cancel{PV} \times \left(1 + \frac{5.5}{400}\right)^{4\times2=8}}{\cancel{PV} \times \left(1 + \frac{5.5}{400}\right)^{4}}$$

$$r = \left(1 + \frac{5.5}{400}\right)^{4}$$ M1A1

$r = 1.056$ (4 s.f.) A1

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b) $\cancel{2P = P \times \left(1 + \frac{5.5}{400}\right)^{4n}}$

N/A

5.

a) $f(-x) = \dfrac{3(-x)^2 + 10}{(-x)^2 - 4}$ A1

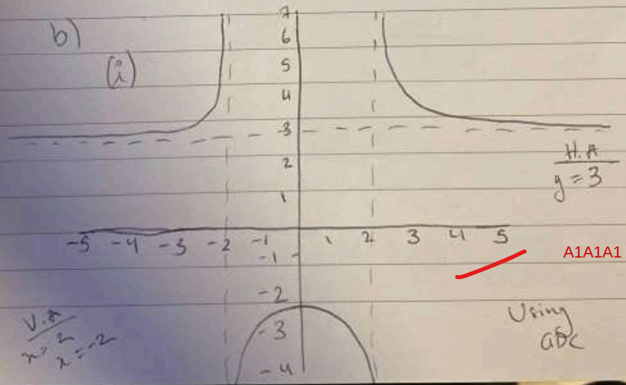
$= \dfrac{3x^2 + 10}{x^2 - 4}$

$f(-x) = f(x)$ R1

hence proved that the function is even.

b)

(i)




A1A1A1

(ii)

$f(x) \leq -2.5$ A1

$f(x) > 2$ A1

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6.

a) $p^3 + \cancel{3pq^2} + \cancel{3p^2q} + q^3 - \cancel{3p^2q} - \cancel{3pq^2}$ A1

$= p^3 + q^3$ AG

b)

$x^2 - \frac{5}{2}x + \frac{1}{2} = 0$

$\alpha\beta = \frac{1}{2}$ A1

$\frac{1}{(\alpha\beta)^3} = \frac{1}{\left(\frac{1}{2}\right)^3} = 8$ M1

$n = 8$ A1

$\alpha + \beta = \frac{5}{2}$ A1

$\frac{1}{\alpha^3} + \frac{1}{\beta^3} = \frac{(\alpha+\beta)^3 - 3\alpha\beta(\alpha+\beta)}{(\alpha\beta)^3}$ M1

$$= \frac{\left(\frac{3}{2}\right)^3 - \left(\frac{3}{2}\right)\left(\frac{5}{2}\right)}{\frac{1}{8}}$$

$\underline{\underline{m = -95}}$ A1

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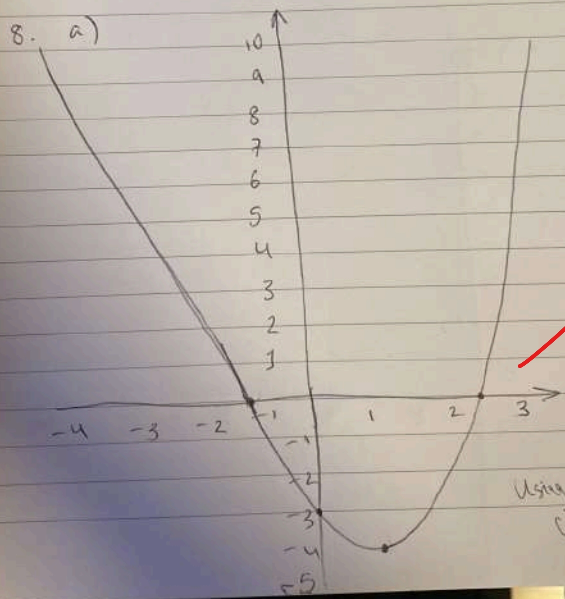
7. N/A

8. a)

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Using GDC

b) $g(x) = f\left(\frac{x}{k}\right) + c$ ✓

$e^{\frac{x}{k}} - 3\left(\frac{x}{k}\right) - 4 + c = e^{2x} - 6x - 7$ ✓

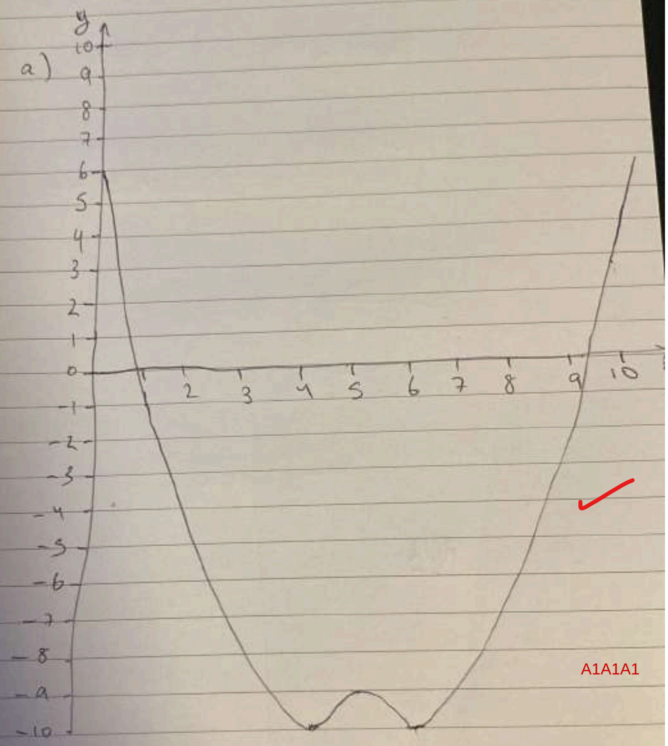
$k = \frac{1}{2}$ ✓ A1

$c = -3$ ✓ A1

5/5

9.

a)

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b) $x = 0.838$ (3 s.f.)

$x = 9.16$ (3 s.f.)

A1A1

5/5

10.

a) $0 \leq x < \infty$ $x \neq 16$ A1A1

$0 \leq x < 16 \cup 16 < x < \infty$

b) $\frac{4-x^2}{4-\sqrt{x}} \geq 1$

$4-x^2 \geq 4-\sqrt{x}$

$-x^2 \geq -\sqrt{x}$

N/A

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