The Mathematical Association of Victoria

Trial Examination 2021

MATHEMATICAL METHODS

Trial Written Examination 2 - SOLUTIONS

SECTION A: Multiple Choice

Question	Answer	Question	Answer
1	D	**11**	D
2	B	**12**	E
3	A	**13**	E
4	E	**14**	B
5	E	**15**	C
6	C	**16**	B
7	A	**17**	C
8	C	**18**	B
9	D	**19**	A
10	A	**20**	C

Question 1 **Answer D**

$y = -2\cos\left(\frac{x}{3}\right) - \frac{1}{2}$

The amplitude is 2.

The period is $\frac{2\pi}{\frac{1}{3}} = 6\pi$.

Question 2 **Answer B**

$g : D \to R, g(x) = \frac{1}{1+3x}$ has range $[-0.5, \ -0.2)$.

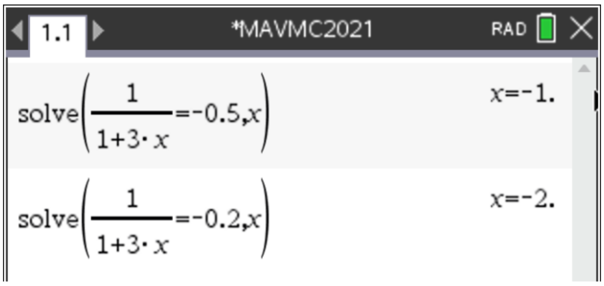
Solve $\frac{1}{1+3x} = -0.5$ and $\frac{1}{1+3x} = -0.2$ for *x*.

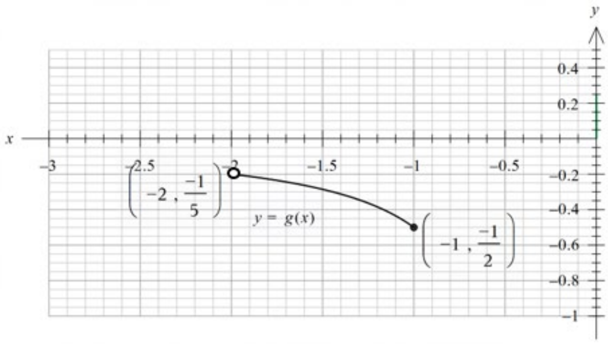
$x = -1$ and $x = -2$

The coordinates of the endpoints are $(-2, -0.2)$ and $(-1, -0.5)$.

g is a decreasing function.

The domain is $(-2, \ -1]$

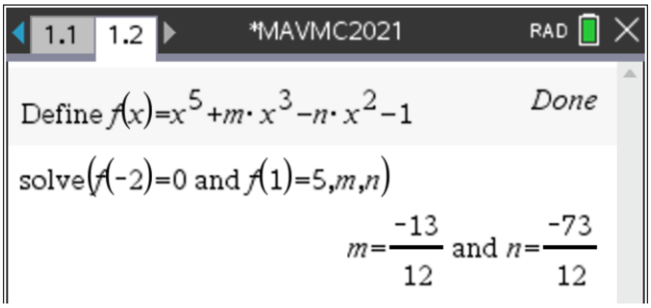




Question 3 **Answer A**

$f(x) = x^5 + mx^3 - nx^2 - 1$

Solve $f(-2) = 0$ and $f(1) = 5$.



Question 4 **Answer E**

$nx - 2y = m$

$n^2 x + 6y = m + 1$

The gradients need to be the same for no solutions.
Using ratios

$n = -\frac{2}{6}n^2$

$-n^2 = 3n$

$-n(n+3) = 0$

$n = 0$ or $n = -3$

$-\frac{1}{3} = \frac{m}{m+1}$ for infinite number of solutions

$m + 1 = -3m$

$m = -\frac{1}{4}$

So, for no solutions

$n = 0,\ m \in R \setminus \left\{-\frac{1}{4}\right\}$ or $n = -3,\ m \in R \setminus \left\{-\frac{1}{4}\right\}$

OR

The gradients need to be the same for no solutions and the y-intercepts need to be different.

$nx - 2y = m$

$y = \frac{nx}{2} - \frac{m}{2}$

$n^2x + 6y = m + 1$

$y = \frac{-n^2x}{6} + \frac{m+1}{6}$

The gradients need to be the same for no solutions.

$\frac{n}{2} = -\frac{n^2}{6}$

$-n^2 = 3n$

$-n(n+3) = 0$

$n = 0$ or $n = -3$

$-\frac{m}{2} = \frac{m+1}{6}$ for infinite number of solutions

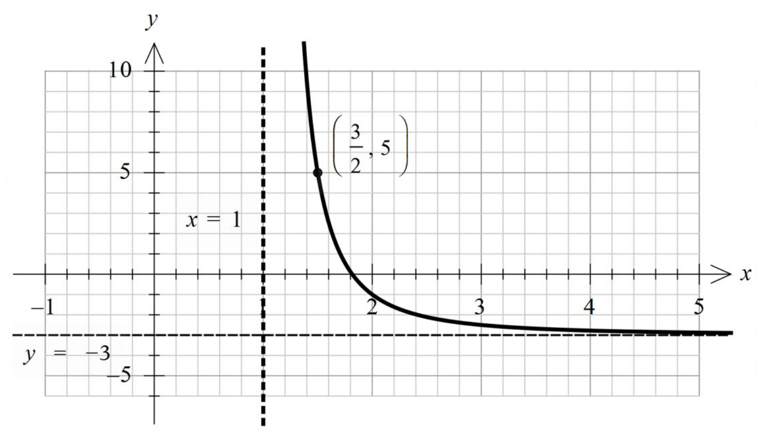
$-3m = m + 1$

$m = -\frac{1}{4}$

So for no solutions

$n = 0,\ m \in R \setminus \left\{-\frac{1}{4}\right\}$ or $n = -3,\ m \in R \setminus \left\{-\frac{1}{4}\right\}$

Question 5 **Answer E**



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

Solve $5 = \frac{a}{(1.5-1)^2} - 3$ for a.

$a = 2$

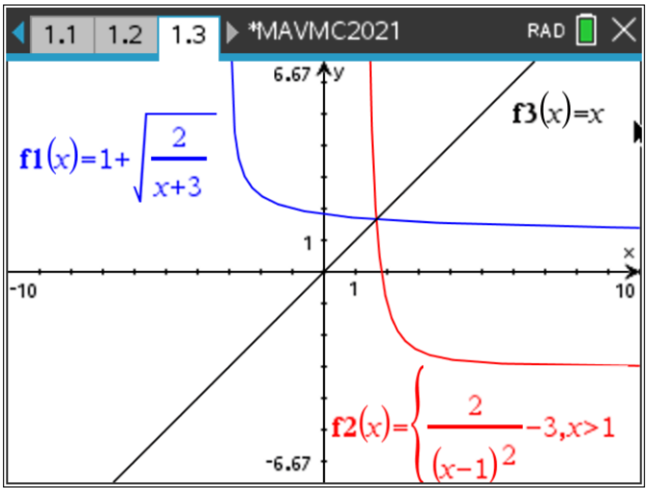
$y = \frac{2}{(x-1)^2} - 3$

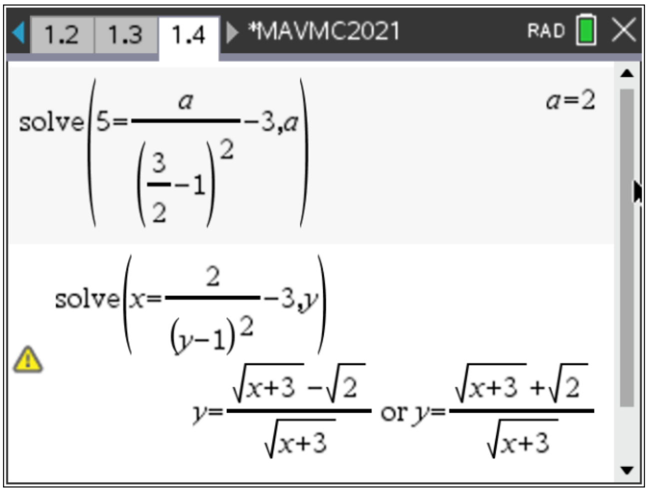
Inverse swap x and y and solve for y.

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

$y = 1 \pm \sqrt{\frac{2}{x+3}}$

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

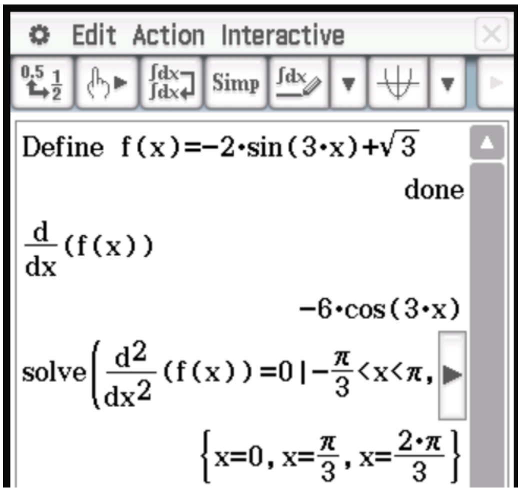




Question 6 **Answer C**

$f:\left[-\frac{\pi}{3},\pi\right]\to R, f(x)=-2\sin(3x)+\sqrt{3}$.

Maximum rate of change is when the gradient is at its maximum.
One method is to look where the 2nd derivative $f''(x)=0$, which gives the maximum and minimum gradient points. Remember that the gradient does not exist at an end-point.

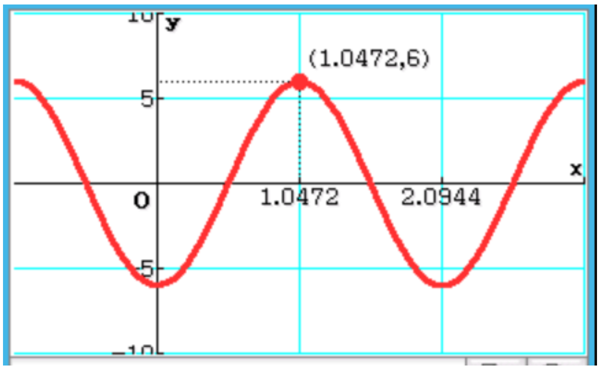


Note $x=0, x=\frac{2\pi}{3}$ are minimums

The maximum is at $x=\frac{\pi}{3}$.

OR

Sketch a graph of the derivative, $f'(x)=-6\cos(3x)$



This shows that the maximum rate of change is at $x=\frac{\pi}{3}$ only.

Question 7 **Answer A**

$f:\left[0,\frac{\pi}{2}\right)\to R, f(x)=\tan(x)$ and $g(x)=\sqrt{2x+1}$ over its maximal domain.

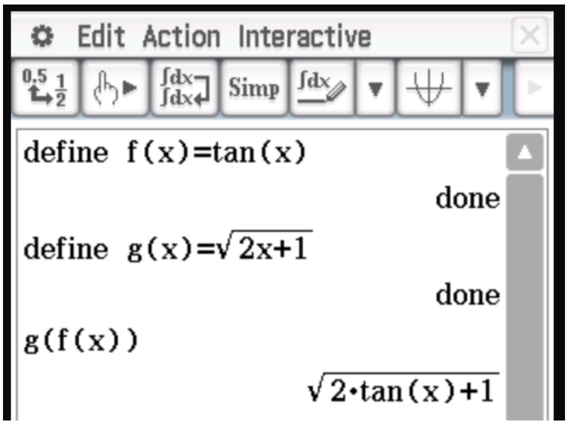
For the composite function $h(x)=g(f(x))$ to exist the range of f must be a subset or equal to the domain of g.

Is the range of $f\subseteq$ domain of g?

Is $[0,\infty)\subset\left[-\frac{1}{2},\infty\right)$? Yes true.

So, the domain of $g(f(x))$ is the same as the domain of f which is $\left[0, \frac{\pi}{2}\right)$.

Rule of $g(f(x)) = \sqrt{2\tan(x)+1}$



Answer: $h(x) = \sqrt{2\tan(x)+1}$ and $x \in \left[0, \frac{\pi}{2}\right)$

Question 8 **Answer C**

Function $y = -\sqrt{x}$ transformed to the image rule $y = -\sqrt{3x+1} - \frac{1}{4}$

Transformations, in an appropriate order are

- a translation of 1 unit left, giving $y_1 = -\sqrt{x+1}$
- a dilation by a factor of $\frac{1}{3}$ from the y-axis, giving $y_2 = -\sqrt{3x+1}$
- a translation of $\frac{1}{4}$ of a unit down, giving $y_3 = -\sqrt{3x+1} - \frac{1}{4}$

Question 9 **Answer D**

$T\left(\begin{bmatrix} x \\ y \end{bmatrix}\right) = \begin{bmatrix} 3 & 0 \\ 0 & -2 \end{bmatrix}\begin{bmatrix} x \\ y \end{bmatrix} + \begin{bmatrix} 1 \\ 0 \end{bmatrix}$ is applied to $y = -x^4$

Expanding matrices gives $\begin{bmatrix} 3x+1 \\ -2y \end{bmatrix} = \begin{bmatrix} x_1 \\ y_1 \end{bmatrix}$

$x = \frac{x'-1}{3}$ and $y = \frac{y'}{-2}$

Substitute in the equation $y = -x^4$

$$\frac{y'}{-2} = -\left(\frac{x'-1}{3}\right)^4$$

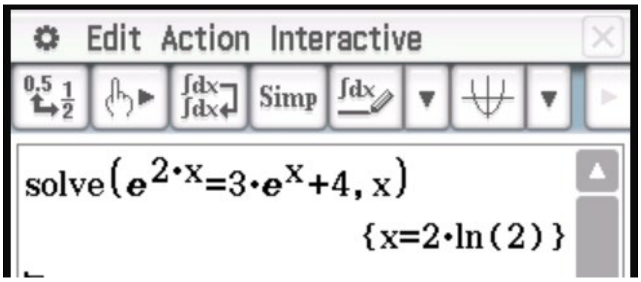
$$y' = 2\left(\frac{x'-1}{3}\right)^4$$

Matching Answer D: $y = \frac{2(x-1)^4}{81}$

Question 10 **Answer A**

Area enclosed equals upper $y = g(x) = 3e^x + 4$ minus lower $y = f(x) = e^{2x}$

From $x = 0$ to point of intersection at $x = 2\ln(2) = \ln(4)$



Area = $\int_{0}^{2\log_e(2)} \left(g(x) - f(x)\right)dx$

Swapping limits gives $\int_{\log_e(4)}^{0} \left(f(x) - g(x)\right)dx$

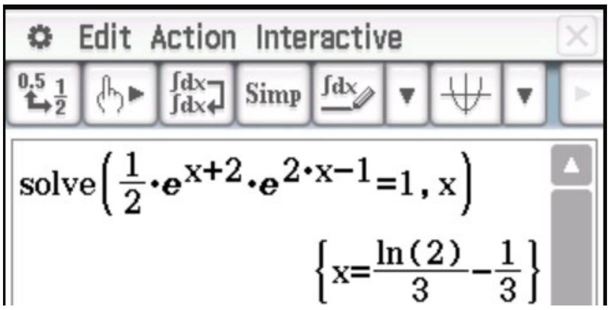
Question 11 **Answer D**

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

$g(1-x) = \frac{1}{2^{1-x}} = \frac{1}{2} \times 2^x = \frac{1}{2}g(-x)$

Question 12 **Answer E**

$\frac{1}{2}e^{x+2} \times e^{2x-1} = 1$



Using Change of base answer equals $x = \frac{\log_2(2)}{3\log_2(e)} - \frac{1}{3} = \frac{1}{3\log_2(e)} - \frac{1}{3}$

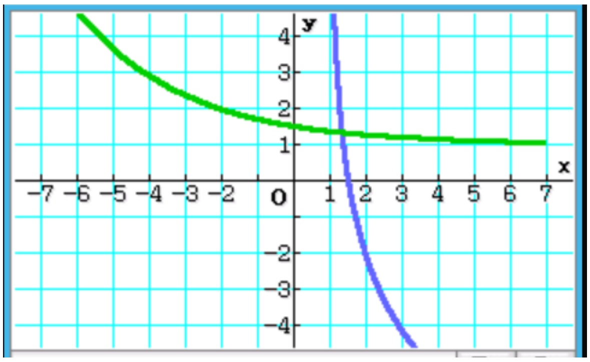
Question 13 **Answer E**

$f(x) = -3\log_e(2x-2)$ has vertical asymptote at $x = 1$

Inverse f^{-1} is an exponential function with a horizontal asymptote at $y = 1$

Possible answers are D or E

y-intercept of f^{-1} sits between $y = 1$ and $y = 2$



Matching Answer E

Question 14 **Answer B**

The length of the pieces of wire are $20-4x$ cm and $4x$ cm.

Rectangle

Perimeter is $20-4x$ cm

$6w = 20-4x$, where w is the width of the rectangle

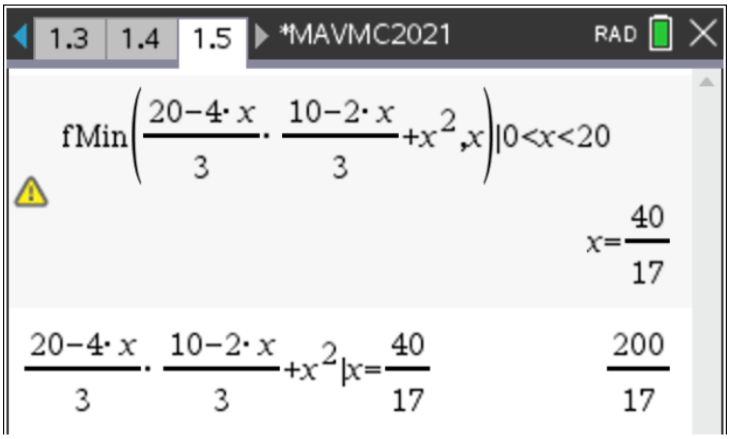
$w = \dfrac{10-2x}{3}$, $l = \dfrac{20-4x}{3}$

$A_{rectangle} = \left(\dfrac{10-2x}{3}\right)\left(\dfrac{20-4x}{3}\right)$

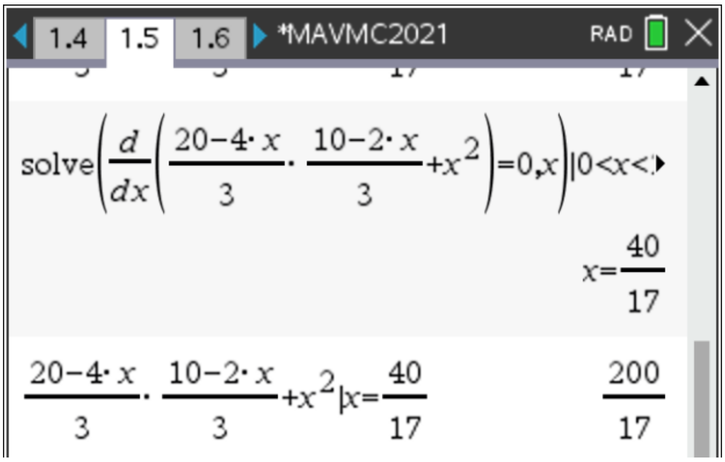
$A_{rectangle} + A_{square} = \left(\dfrac{10-2x}{3}\right)\left(\dfrac{20-4x}{3}\right) + x^2$

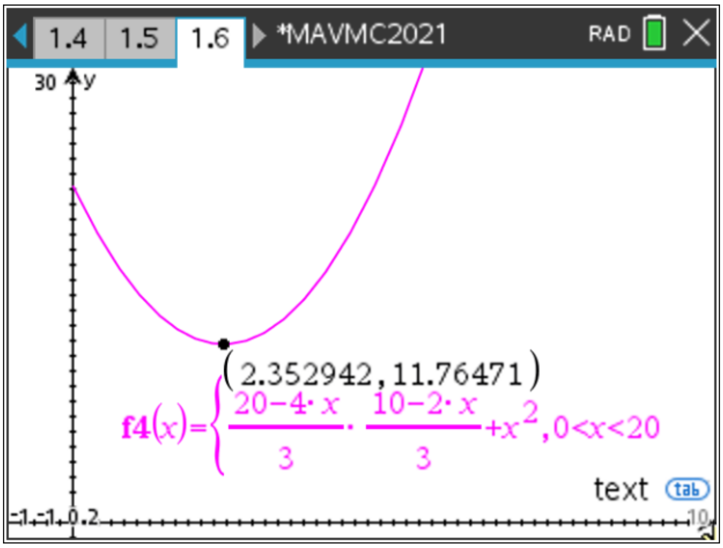
For the minimum area $x = \dfrac{40}{7}$.

Minimum area is $\dfrac{200}{17}$ cm^2


1.3 1.4 1.5 *MAVMC2021 RAD
fMin((20−4·x)/3·(10−2·x)/3+x^2,x)|0<x<20
x=40/17
(20−4·x)/3·(10−2·x)/3+x^2|x=40/17
200/17

OR


1.4 1.5 1.6 *MAVMC2021 RAD
solve(d/dx((20−4·x)/3·(10−2·x)/3+x^2)=0,x)|0<x<
x=40/17
(20−4·x)/3·(10−2·x)/3+x^2|x=40/17
200/17


1.4 1.5 1.6 *MAVMC2021 RAD
30
y
(2.352942, 11.76471)
f4(x)={(20−4·x)/3·(10−2·x)/3+x^2,0<x<20
text tab
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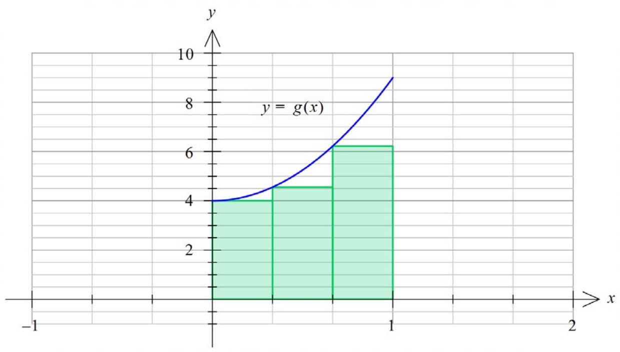
Question 15 **Answer C**



$y = g(x) = 5x^2 + 4$

Left-endpoint rectangles

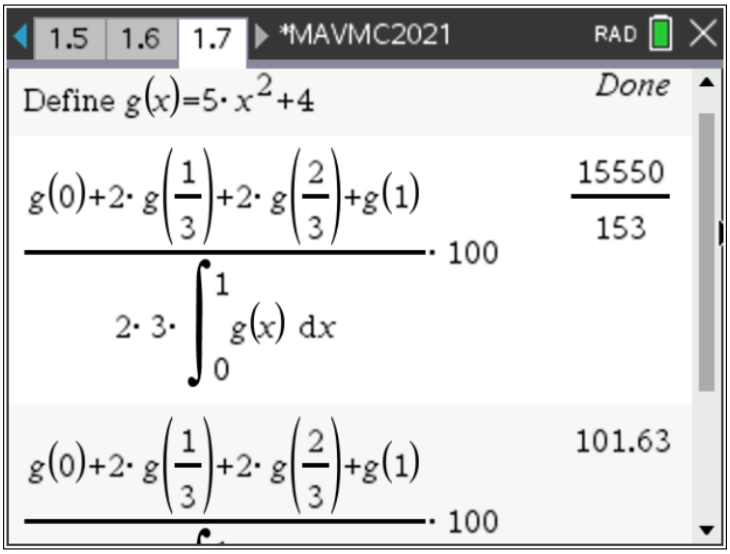
$$A_L = \frac{1}{3}\left(g(0) + g\left(\frac{1}{3}\right) + g\left(\frac{2}{3}\right)\right)$$

Right-endpoint rectangles

$$A_R = \frac{1}{3}\left(g\left(\frac{1}{3}\right) + g\left(\frac{2}{3}\right) + g(1)\right)$$

$$\text{Average } = \frac{g(0) + 2g\left(\frac{1}{3}\right) + 2g\left(\frac{2}{3}\right) + g(1)}{3 \times 2}$$

$$\text{Percentage of exact area } = \frac{g(0) + 2g\left(\frac{1}{3}\right) + 2g\left(\frac{2}{3}\right) + g(1)}{3 \times 2\int_0^1 (g(x))\,dx} \times 100\% = 101.6\%$$

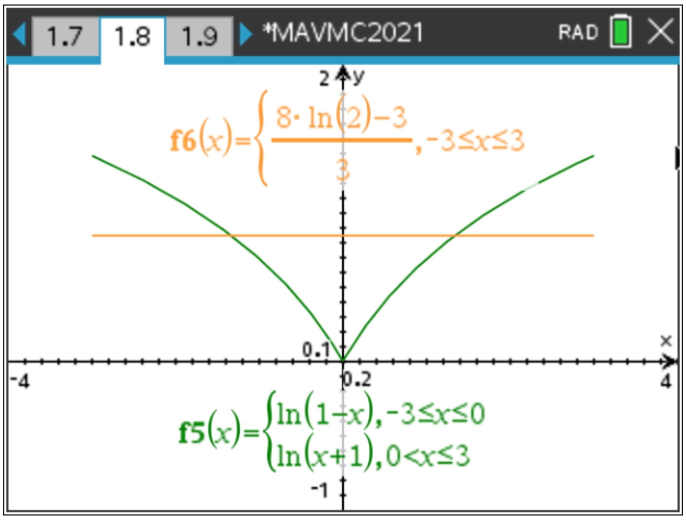


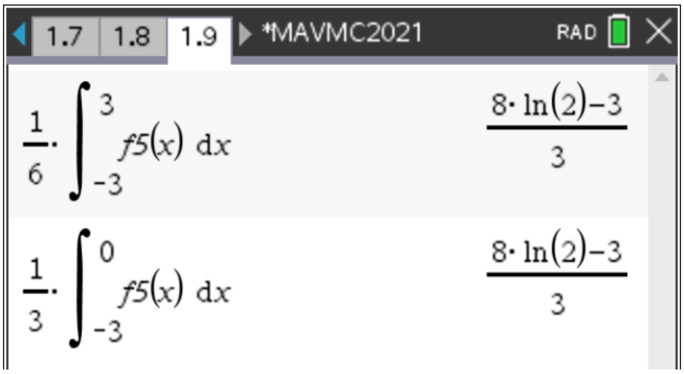
Question 16 **Answer B**

Average value $=\frac{1}{6}\int_{-3}^{3}\left(h(x)\right)dx$

The branches are symmetrical.

Average value $=\frac{2}{6}\int_{-3}^{0}\left(h(x)\right)dx=\frac{1}{3}\int_{-3}^{0}\left(h(x)\right)dx$



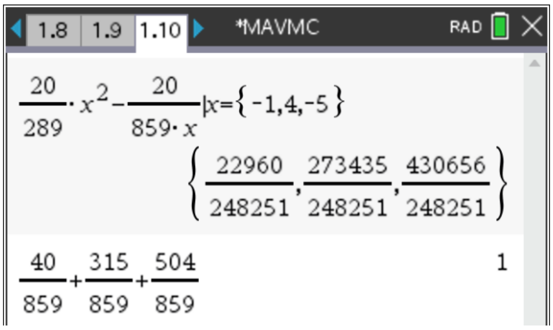


Question 17 **Answer C**

$\Pr(X=x)=\frac{20}{859}x^2-\frac{20}{859x}$

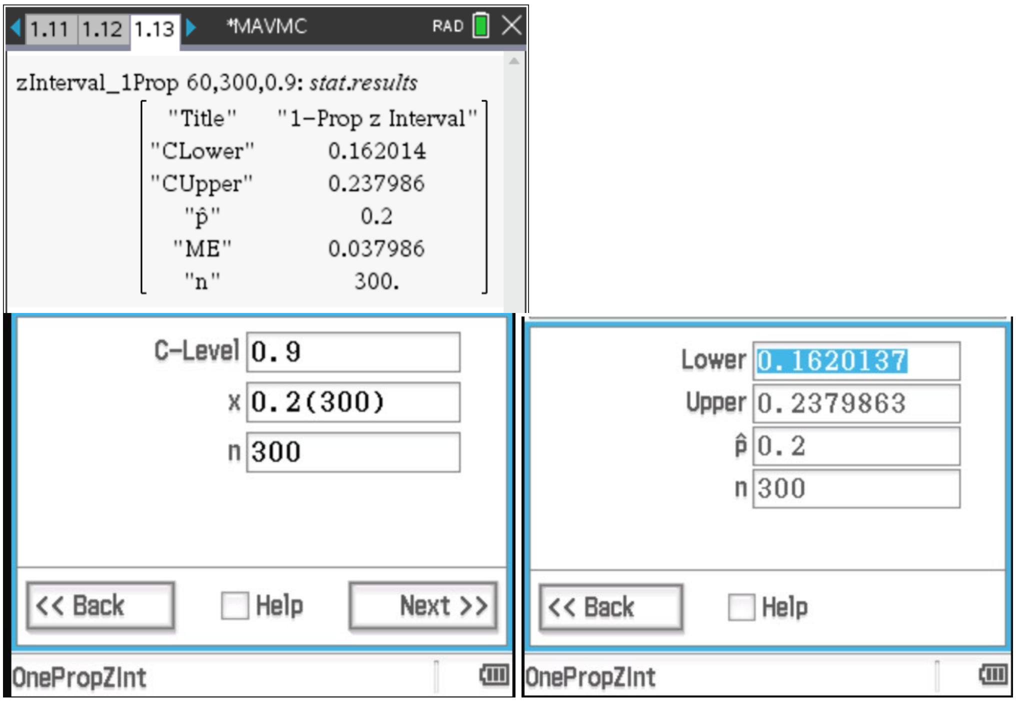
$\Pr(X=-1)+\Pr(X=4)+\Pr(X=-5)$

$=\frac{40}{859}+\frac{315}{859}+\frac{504}{859}=1$



Question 18 **Answer B**

(0.162, 0.238)

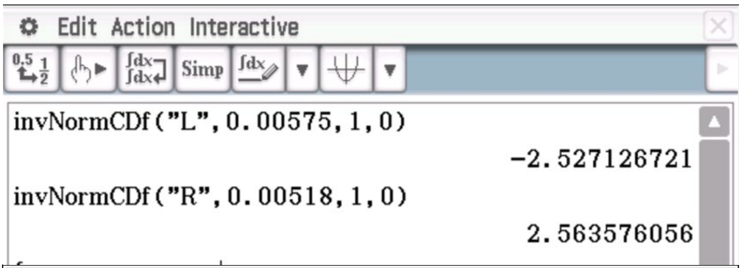


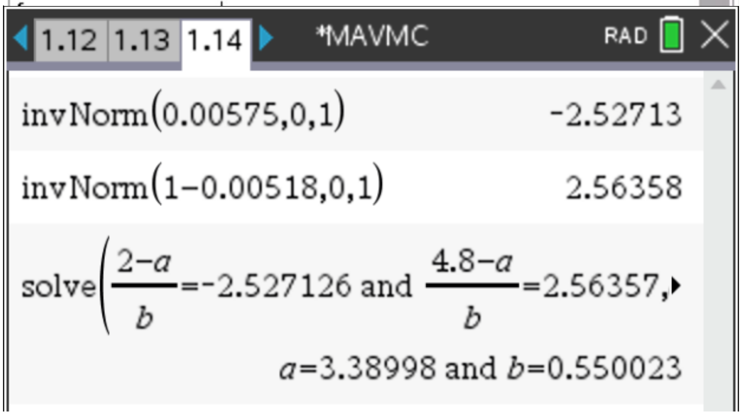
Question 19 **Answer A**

Solve $\dfrac{2-\mu}{\sigma} = -2.527...$ and $\dfrac{4.8-\mu}{\sigma} = 2.563...$

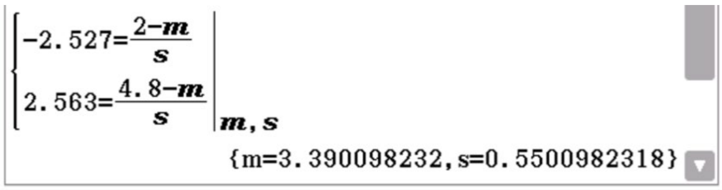
$\mu = 3.39,\ \sigma = 0.55$

$$f(x) = \frac{1}{0.55\sqrt{2\pi}} e^{-\frac{1}{2}\left(\frac{x-3.39}{0.55}\right)^2}$$





Giving $z=-2.527\ldots$and $z=2.563\ldots$



Question 20 **Answer C**

$p \sim \text{Bi}\left(n,\frac{2}{5}\right),\ f \sim \text{Bi}\left(n,\frac{3}{5}\right)$

Examples

$$f(n)=\binom{n}{n}\left(\frac{3}{5}\right)^n\left(\frac{2}{5}\right)^0=p(0)=\binom{n}{0}\left(\frac{2}{5}\right)^0\left(\frac{3}{5}\right)^n$$

$$f(n-1)=\binom{n}{n-1}\left(\frac{3}{5}\right)^{n-1}\left(\frac{2}{5}\right)=p(1)=\binom{n}{1}\left(\frac{2}{5}\right)\left(\frac{3}{5}\right)^{n-1}$$

In general

$$f(m)=\binom{n}{m}\left(\frac{3}{5}\right)^m\left(\frac{2}{5}\right)^{n-m}=p(n-m)=\binom{n}{n-m}\left(\frac{2}{5}\right)^{n-m}\left(\frac{3}{5}\right)^m$$

$$f(m)=p(n-m)$$

SECTION B

Question 1

a. $\frac{2x+1}{2x-3}$

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

$=\frac{2x-3+4}{2x-3}$

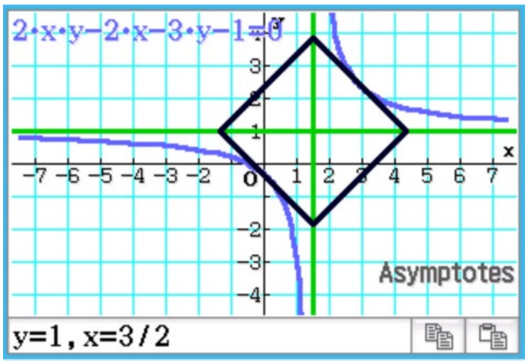
$=\frac{2x-3}{2x-3}+\frac{4}{2x-3}$

$=1+\frac{4}{2x-3}$

giving $a=1$ and $b=4$ **1M Show that**

$f(x)=\frac{2x+1}{2x-3}=1+\frac{4}{2x-3}$

b.i. By inspection the asymptotes are $y=1$ and $x=\frac{3}{2}$. **1A**



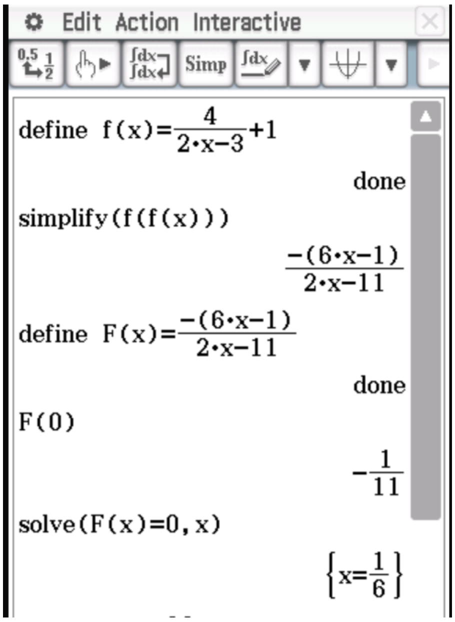
ii. domain $R\backslash\left\{\frac{3}{2}\right\}$, range $R\backslash\{1\}$ **2A**

$f_1:\left[-\frac{1}{2},\frac{1}{6}\right]\to R,\ f_1(x)=\frac{2x+1}{2x-3},\ y=f_1\left(f_1(x)\right)=\frac{1-6x}{2x-11}$

c. For $f_1\left(f_1(x)\right)$ to exist test range $f_1\subseteq$ domain f_1.

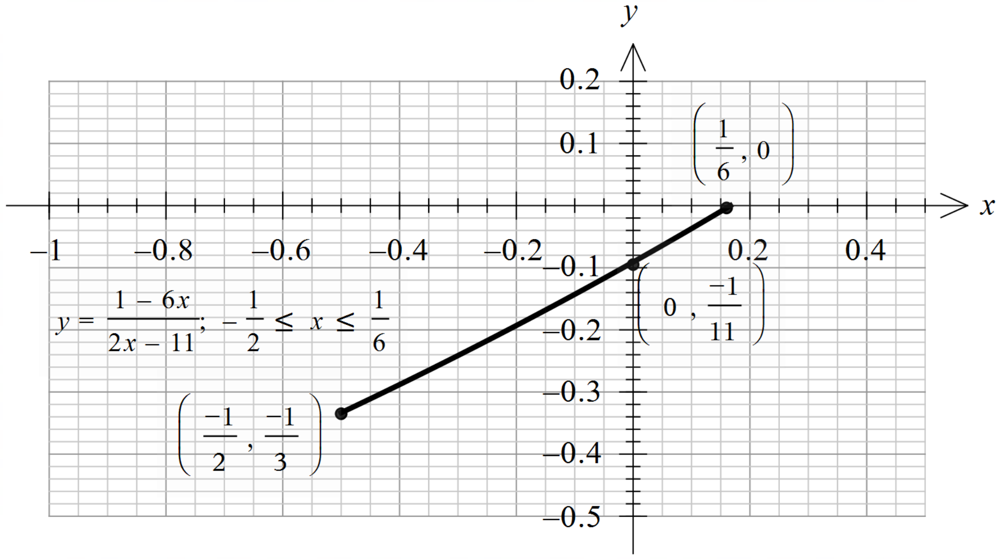
range $\left[-\frac{1}{2},0\right]\subset\left[-\frac{1}{2},\frac{1}{6}\right]$ **1A**

d.i. $\left(0,-\frac{1}{11}\right)$ and $\left(\frac{1}{6},0\right)$ **2A**



ii. shape **1A**

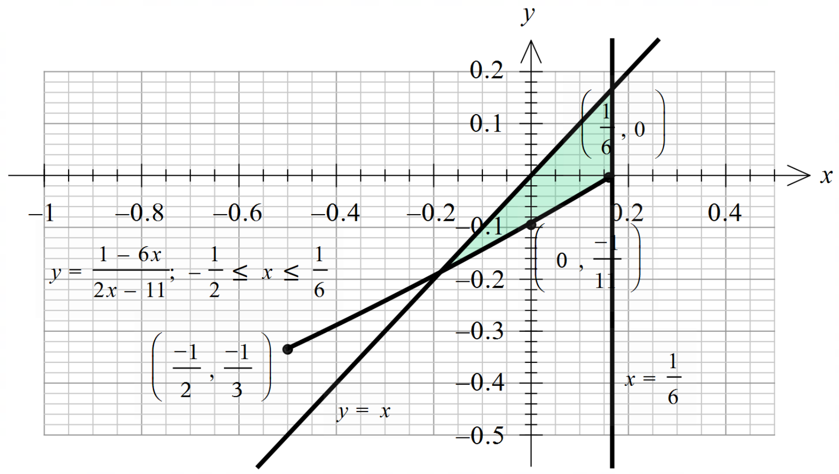
axial intercepts and endpoints $\left(-\frac{1}{2},-\frac{1}{3}\right)$ $\left(0,-\frac{1}{11}\right)$ and $\left(\frac{1}{6},0\right)$ **1A**

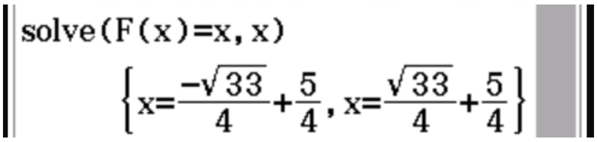


e.i. Solve $g(x)=x$

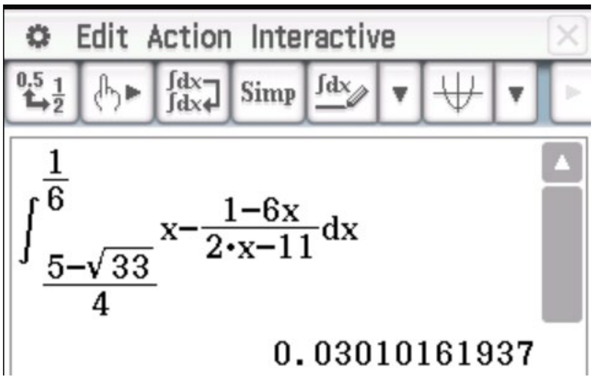
$x=\dfrac{5-\sqrt{33}}{4}$ **1A**

Area $=\displaystyle\int_{\frac{5-\sqrt{33}}{4}}^{\frac{1}{6}}(x-g(x))\,dx=\int_{\frac{5-\sqrt{33}}{4}}^{\frac{1}{6}}\left(x-\frac{1-6x}{2x-11}\right)dx=\int_{\frac{5-\sqrt{33}}{4}}^{\frac{1}{6}}\left(x+\frac{6x-1}{2x-11}\right)dx$ **1A (any)**

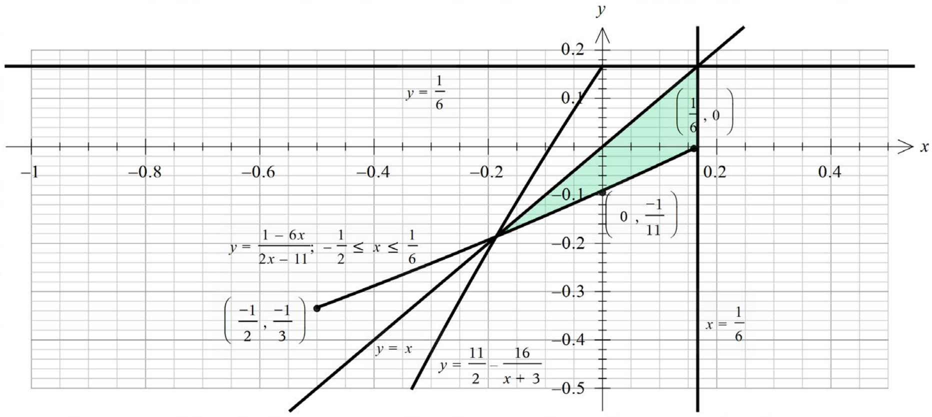




ii. 0.030 correct to three decimal places **1A**



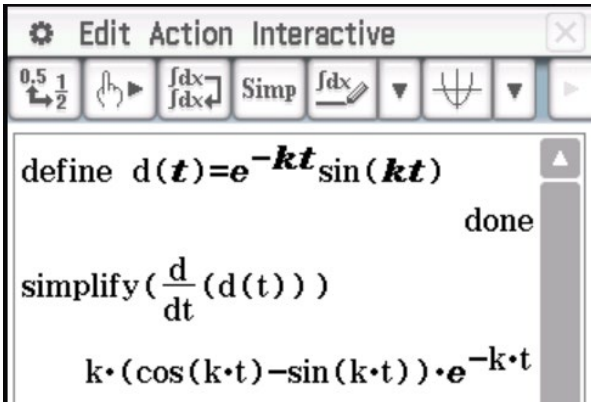
iii. 0.030 correct to three decimal places **1H**



Question 2

$d(t) = e^{-kt}\sin(kt)$

a. $d'(t) = ke^{-kt}(\cos(kt) - \sin(kt))$ **1A**



b.i. Solve $d'(t) = ke^{-kt}(\cos(kt) - \sin(kt)) = 0$

gives $ke^{-kt} = 0$ no solution. **1M**

and $(\cos(kt) - \sin(kt)) = 0$

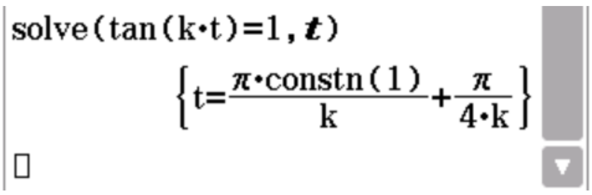
$\cos(kt) = \sin(kt)$

$\frac{\cos(kt)}{\cos(kt)} = \frac{\sin(kt)}{\cos(kt)}$

giving $\tan(kt) = 1$ **1M Show that**

ii. $d'(t) = 0,\ \tan(kt) = 1$

giving general solution $t = \frac{\pi}{4k} + \frac{\pi}{k}n$ where $k \in R^+,\ n \in \{0\} \cup Z^+$ **1A**



iii. $t = \frac{\pi}{4k} + \frac{\pi}{k}n$

For $d : \left[0, \frac{2}{k}\right] \to R, d(t) = e^{-kt}\sin(kt)$

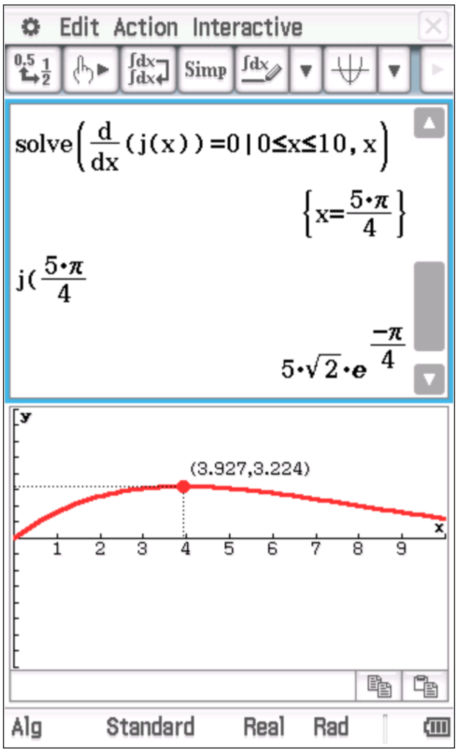
Letting $n = 0$ gives the local maximum stationary point at $t = \frac{\pi}{4k}$ **1A**

Let $d_j : [0,10] \to R, d_j(t) = 10e^{-0.2t}\sin(0.2t)$

c. Solve $d_j'(t) = 0$

At $t = \frac{5\pi}{4}$ minutes **1A**

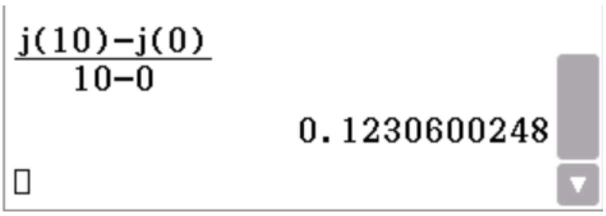
maximum amount $= 5\sqrt{2}e^{-\frac{\pi}{4}}$ mg/litre **1A**



d. Average rate of change, for the interval [0, 10]

$\frac{d_j(10) - d_j(0)}{10 - 0}$ **1M**

$= 0.123$ mg/L/min correct to three decimal places **1A**



e. Solve $10e^{-0.2t}\sin(0.2t) = 10e^{-0.2t}$ for $t \in [0,10]$

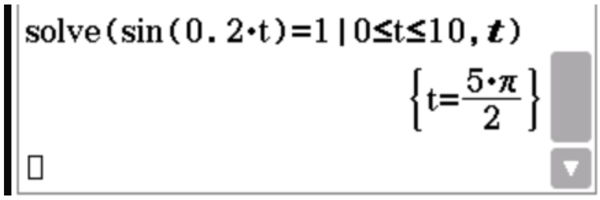
$10e^{-0.2t}\sin(0.2t) - 10e^{-0.2t} = 0$

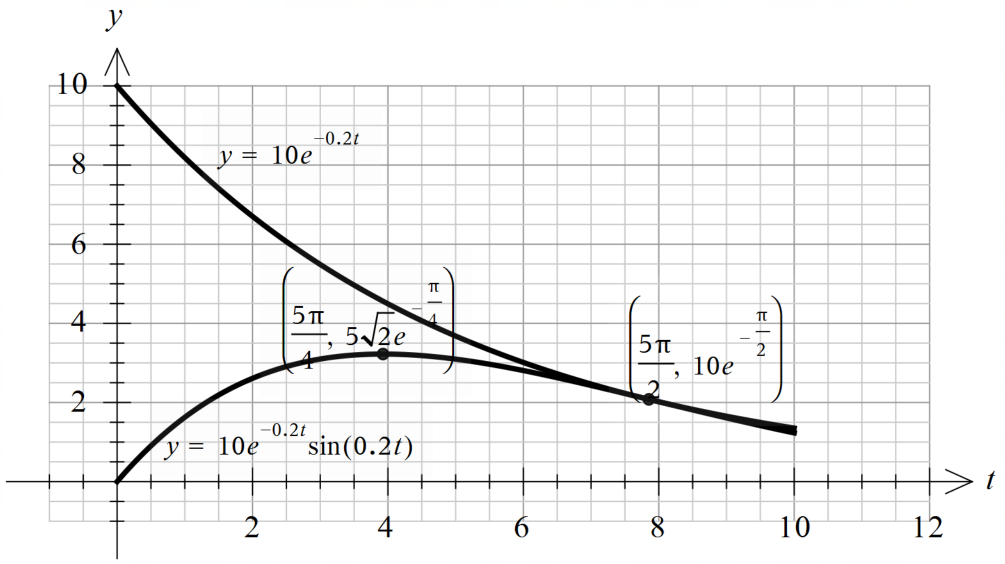
$10e^{-0.2t}\left(\sin(0.2t)-1\right)=0$

$10e^{-0.2t} \neq 0$

$\sin(0.2t)=1,\ t\in[0,10]$ **1M**

Giving one solution $t=\frac{5\pi}{2}\neq\frac{5\pi}{4}$ **1A**





f. $d:\left[0,\frac{2}{k}\right]\to R, d(t)=e^{-kt}\sin(kt)$

(i) For domain $\left[0,\frac{2}{0.2}\right]=[0,10]$

$k=0.2$ horizontal distance $t=\frac{5\pi}{2}-\frac{5\pi}{4}=\frac{5\pi}{4}$ **1A**

(ii) For domain $\left[0,\frac{2}{0.02}\right]=[0,100]$

stationary point where $k=0.02$ at $t=\frac{\pi}{4\times 0.02}=\frac{25\pi}{2}$

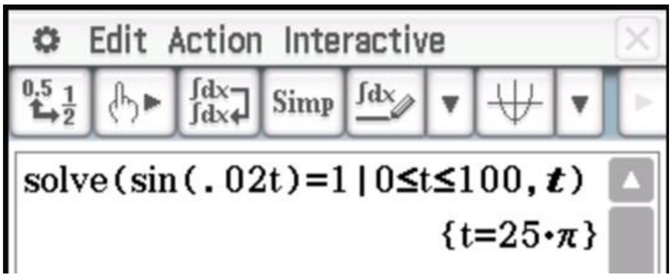
$k=0.02$

Solve $10e^{-0.02t}\sin(0.02t)=10e^{-0.02t}$ for $t\in[0,100]$

Gives $\sin(0.02t)=1,\ t\in[0,100]$

Giving one solution $t=25\pi$

Difference in time $t = 25\pi - \frac{25\pi}{2} = \frac{25\pi}{2}$ **1A**



g. For domain $\left[0, \frac{2}{k}\right]$

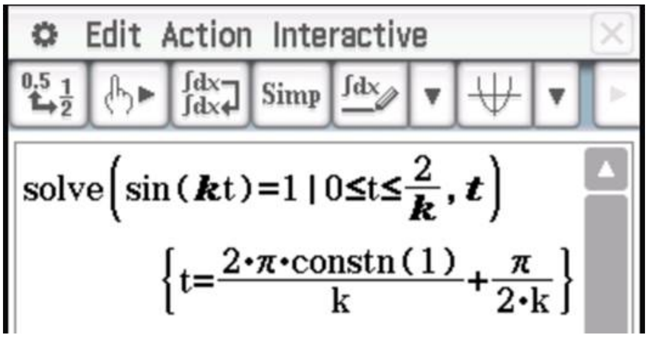
stationary point occurs at $t = \frac{\pi}{4k}$

Point of intersection

Gives $\sin(kt) = 1,\ t \in \left[0, \frac{2}{k}\right]$

Giving one solution $t = \frac{\pi}{2k}$ **1M**

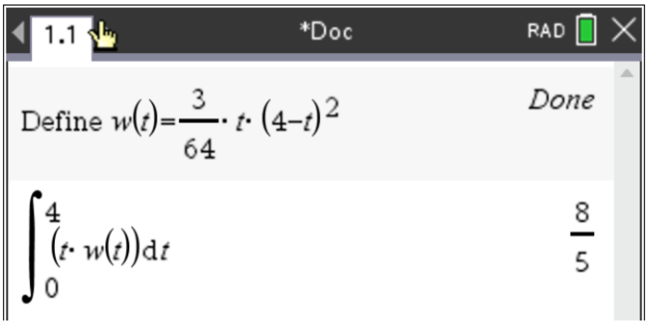
Difference in time $t = \frac{\pi}{2k} - \frac{\pi}{4k} = \frac{\pi}{4k}$ **1A**



Question 3

$$w(t) = \begin{cases} \frac{3}{64}t(4-t)^2 & 0 \le t \le 4 \\ 0 & \text{elsewhere} \end{cases}$$

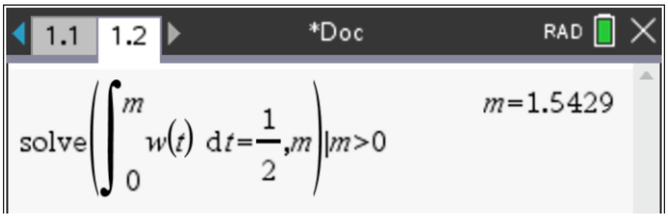
a.i. $\mathrm{E}(T) = \int_0^4 (t \times w(t))dt = \frac{8}{5}$ **1A**



ii. Let m be the median.

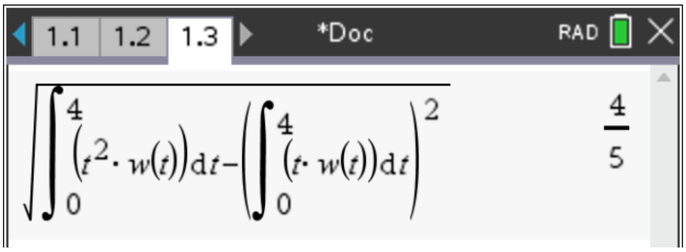
Solve $\int_0^m (w(t)) = \frac{1}{2}$ for m.

$m = 1.54$ minutes **1A**



iii. $\mathrm{sd}(T) = \sqrt{\int_0^4 (t^2 \times w(t)) - \left(\int_0^4 (t \times w(t))dt\right)^2}$ **1M**

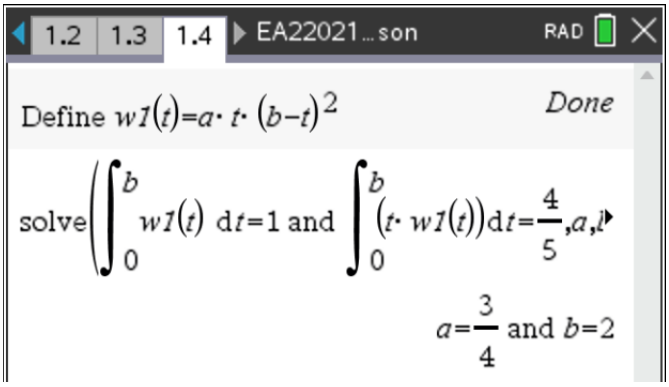
$= \frac{4}{5}$ **1A**



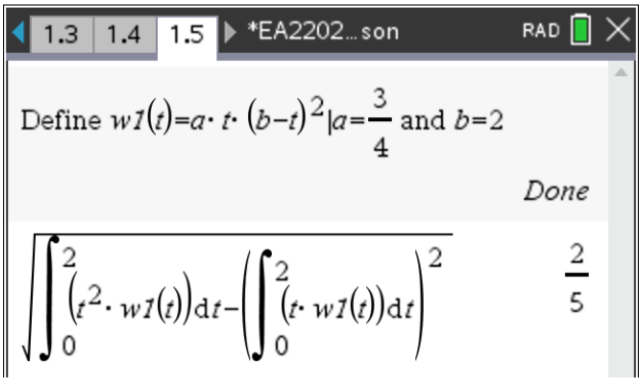
b.i. $w_1(t)=\begin{cases} at(b-t)^2 & 0\le t\le b \\ 0 & \text{elsewhere}\end{cases}$

Solve $\int_0^b \left(w_1(t)dt\right)=1$ and $\int_0^b \left(t\times w_1(t)\right)dt=\frac{4}{5}$ for a and b. **1M**

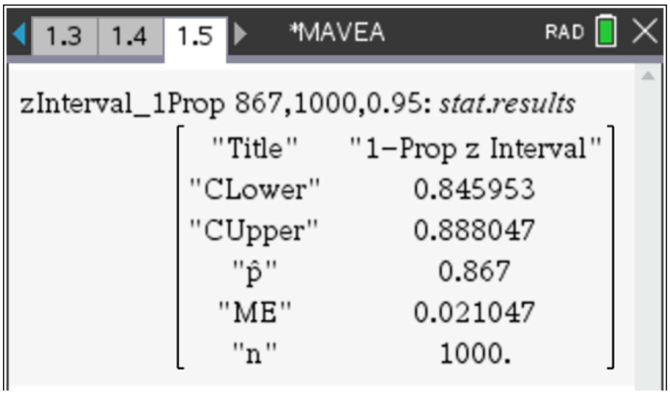
$a=\frac{3}{4},\ b=2$ **1A**



ii. 50% **1A**

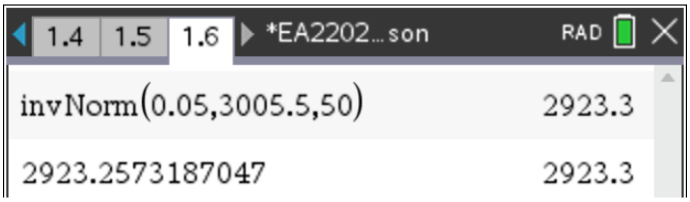


c.i. (0.846, 0.888) **1A**



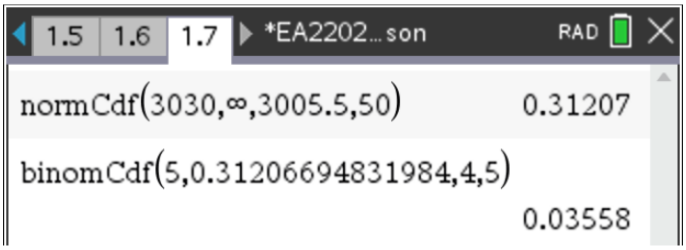
ii. No the factory is not misleading their Office Supplies as 80% is below the confidence interval. The factory should be claiming at least 85%. **1A**

d.i. 2923.3 pages **1A**



ii. $X \sim \text{Bi}(5, 0.3120...)$

$\Pr(X \geq 4) = 0.0356$ correct to four decimal places

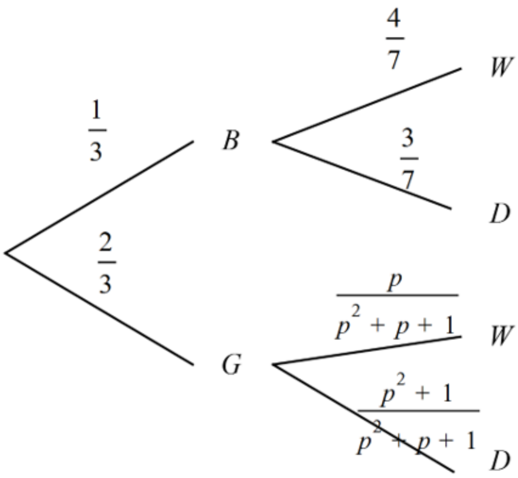


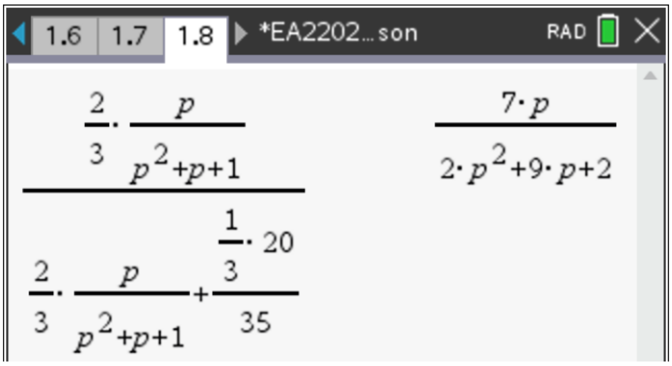
e.i. Let *G* represent the green box, *B* the blue box, *W* a white chocolate and *D* a dark chocolate.

$$\Pr(G|W) = \frac{\Pr(G \cap W)}{\Pr(W)}$$ **1M**

$$= \frac{\frac{2}{3} \times \frac{p}{p^2 + p + 1}}{\frac{2}{3} \times \frac{p}{p^2 + p + 1} + \frac{1}{3} \times \frac{20}{35}}$$

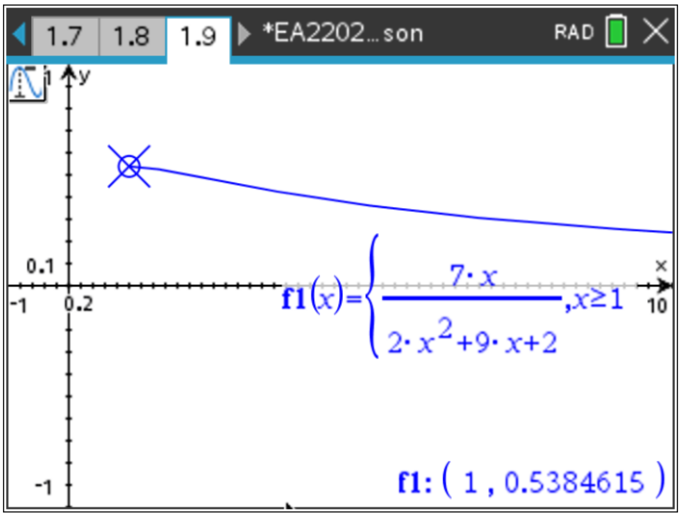
$$= \frac{7p}{2p^2 + 9p + 2}$$ **1A**





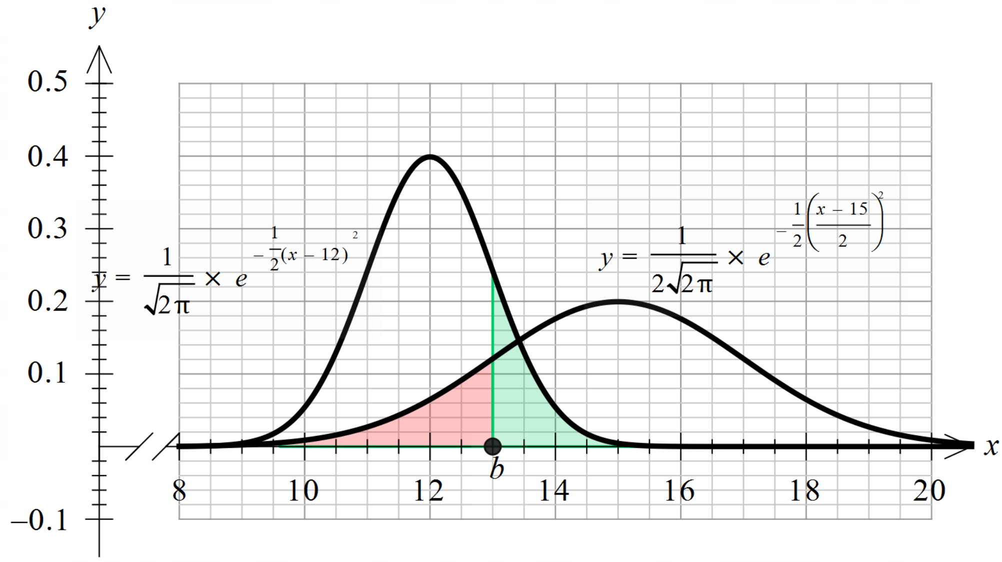
ii. The maximum value occurs when $p = 1$.

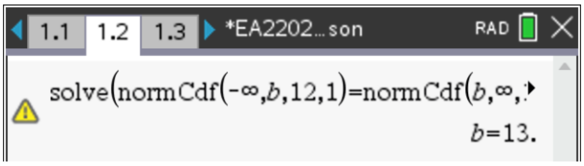
$\Pr(G|W) = \frac{7}{13}$ **1A**

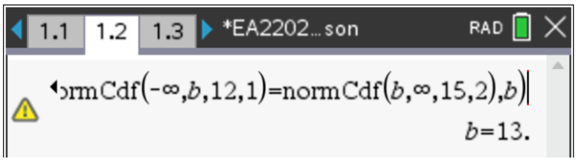


f. Solve $\int_b^\infty \left(\frac{1}{2\sqrt{\pi}} e^{-\frac{1}{2}(b-12)^2}\right) = \int_{-\infty}^b \left(\frac{1}{2\sqrt{\pi}} e^{-\frac{1}{2}\left(\frac{b-15}{2}\right)^2}\right)$ for b. **1M**

$b = 13$ g **1A**



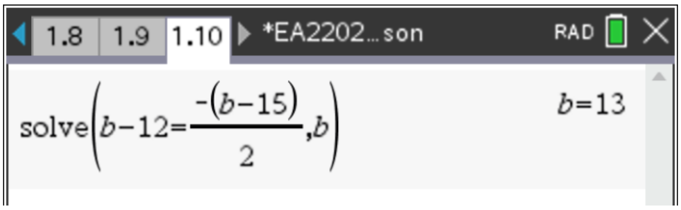




OR
Using z values

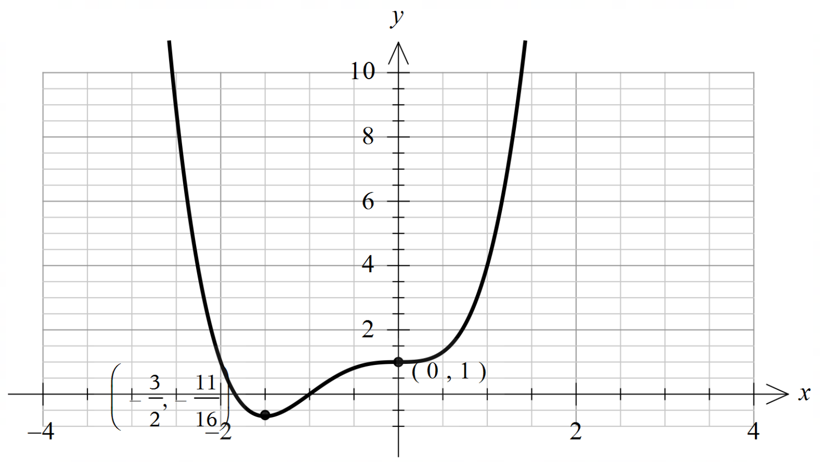
Solve $b-12=-\frac{b-15}{2}$ **1M**

$b=13$ g **1A**



Question 4

a. Correct coordinates labelled on the graph. **1A**

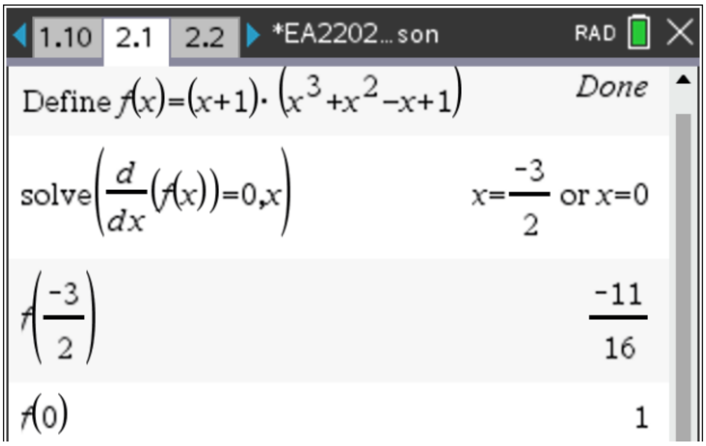


$y=f(x)=(x+1)\left(x^3+x^2-x+1\right)$

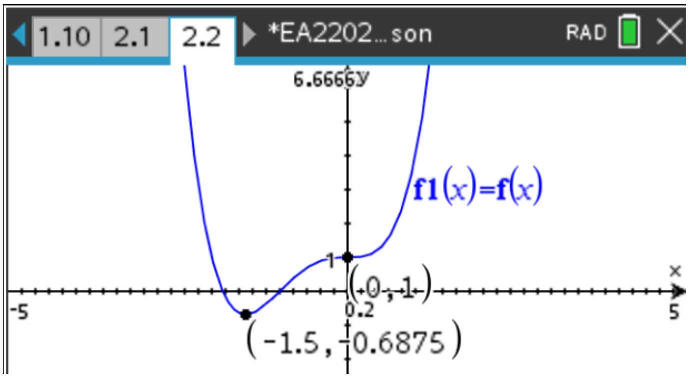
Solve $f'(x)=0$ for x.

$x=-\frac{3}{2}$ or $x=0$

$f\left(-\frac{3}{2}\right)=-\frac{11}{16}=-0.6875$ and $f(0)=1$



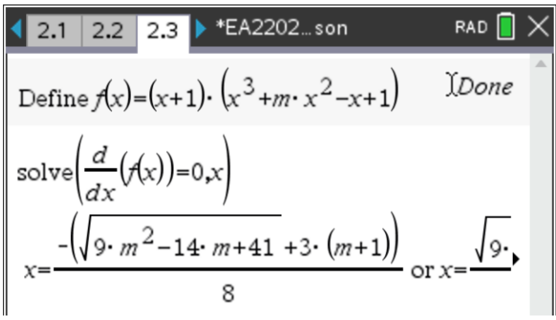
OR
Graphically

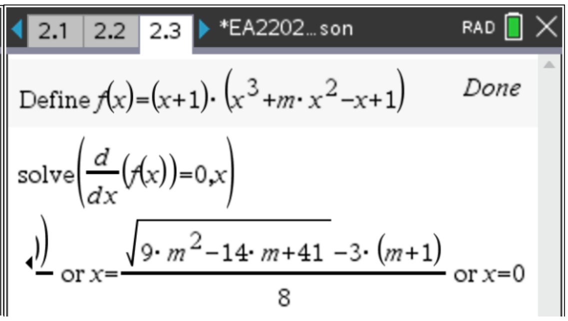


b. $y = f(x) = (x+1)\left(x^3 + mx^2 - x + 1\right)$

Solve $f'(x) = 0$ for x. **1M**

$x = \dfrac{-3(m+1) \pm \sqrt{9m^2 - 14m + 41}}{8}$ or $x = 0$ **1A**

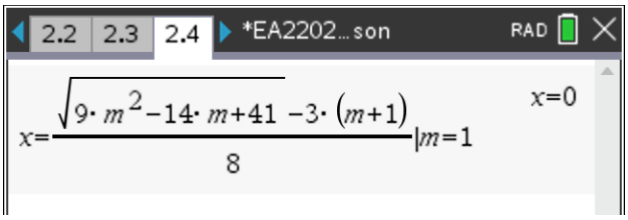




c. $9m^2 - 14m + 41 > 0$ for $m \in R$ hence three solutions

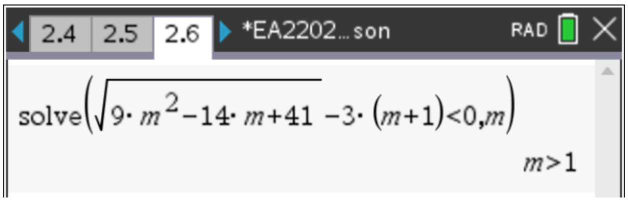
$x = \dfrac{-3(m+1) \pm \sqrt{9m^2 - 14m + 41}}{8}$ or $x = 0$ for $m \in R \setminus \{1\}$. **1A**

When $m = 1$, $x = \dfrac{-3(m+1) + \sqrt{9m^2 - 14m + 41}}{8} = 0$. So only two solution. **1A**

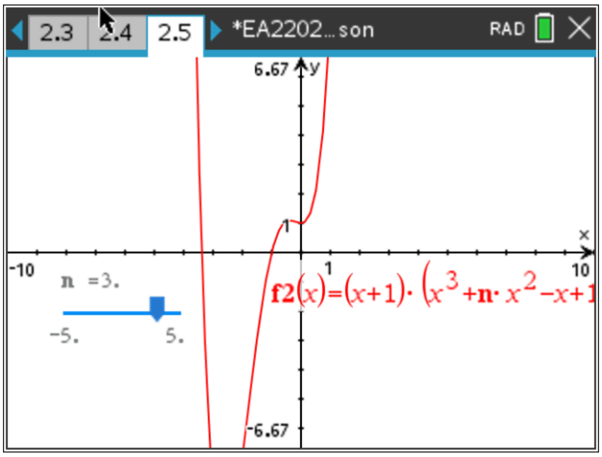


d. $m > 1$ **1A**

Solve $\frac{-3(m+1)+\sqrt{9m^2-14m+41}}{8} < 0$ for m.

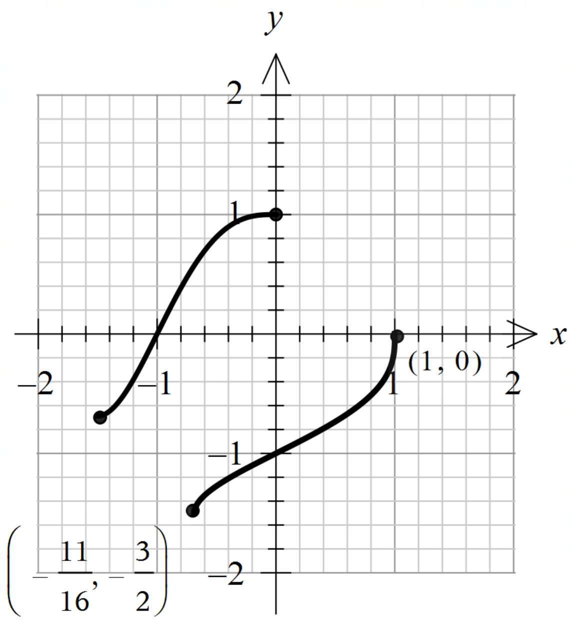


OR
Graphically



e. 1 correct **1A**
All correct **2A**
$m = 1$, stationary point of inflection
$m < 1$, local maximum
$m > 1$, local minimum

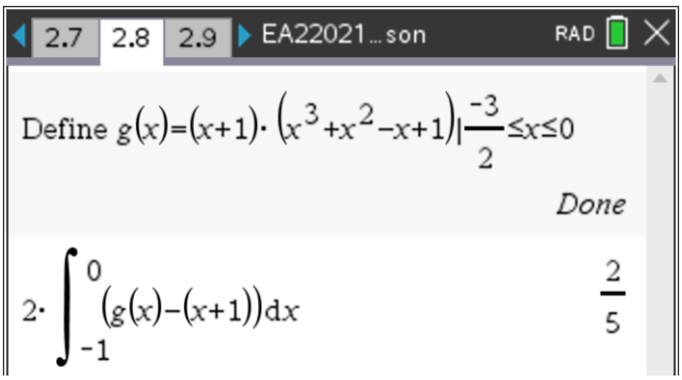
f. $g:\left[-\frac{3}{2},0\right] \to R, g(x)=(x+1)\left(x^3+x^2-x+1\right)$
Shape and endpoints **1A**



g. The graphs of g and g^{-1} are symmetrical about the line $y = x + 1$.
The equation of the inverse is too difficult to find.

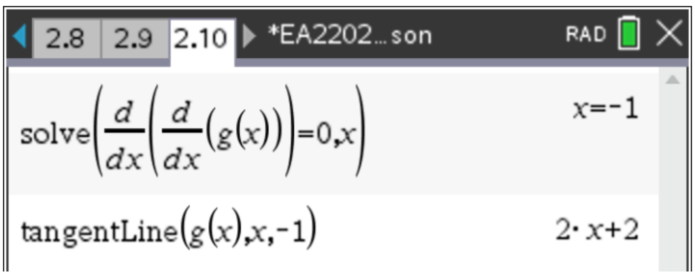
So $\text{Area} = 2\int_{-1}^{0} \left(g(x) - (x+1)\right)dx$ **1M**

$= \dfrac{2}{5}$ **1A**



h. Solve $\dfrac{d}{dx}\left(\dfrac{d}{dx}(g(x))\right) = 0$ for x. **1M**

$x = -1$
The equation of the tangent is $y = 2x + 2$. **1A**



i. endpoints $\left(-\frac{3}{2}, -\frac{11}{16}\right)$ and $(0,\ 1)$

$$m = \frac{1+\frac{11}{16}}{\frac{3}{2}} = \frac{9}{8}$$

The equation of the line passing through the endpoints is $y = \frac{9}{8}x + 1$. **1A**

Dilate by a factor of $\frac{16}{9}$ from the y-axis.

Translate 1 unit down. **1A**

The order does not matter in this case.

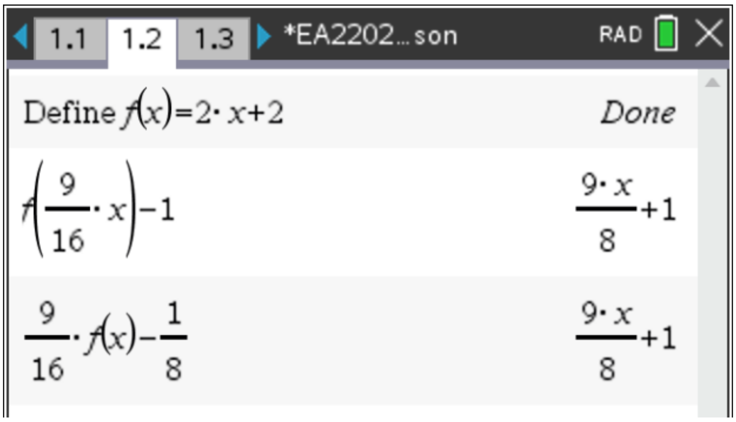
OR

Dilate by a factor of $\frac{9}{16}$ from the x-axis.

Translate $\frac{1}{8}$th of a unit down. **1A**

Order matters in this case.

There are other possibilities.



END OF SOLUTIONS