CAMBRIDGE TECHNOLOGY IN MATHS

Year 11

Linear and quadratic equations

CONTENTS

Example: Solving linear equations

Solve $2.5(x + 7) = 8$.

Solution

Using the TI-Nspire:

1   Press (menu) and select *solve* from the Algebra menu.

2   Type $2.5 \times (x + 7) = 8, x$) and then press (enter).

3   To obtain a decimal answer while in exact mode, press (ctrl) (enter).

| 1.1	RAD EXACT REAL
solve$(2.5 \cdot (x+7)=8,x)$	$x = \dfrac{-19}{5}$
solve$(2.5 \cdot (x+7)=8,x)$	$x = -3.8$
	2/99
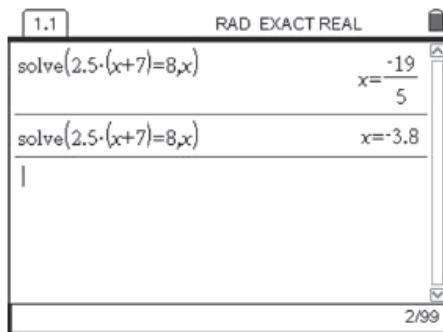
Using the ClassPad:

1   Select the appropriate mode. From the Action menu select *solve* from the Advanced submenu.

2   Type $2.5 \times (x + 7) = 8, x$) and then press (EXE).

▼ Edit Action Interactive ⊠
solve$(2.5 \times (x+7)=8, x)$ $\{x=-3.8\}$
Alg   Decimal   Real Rad
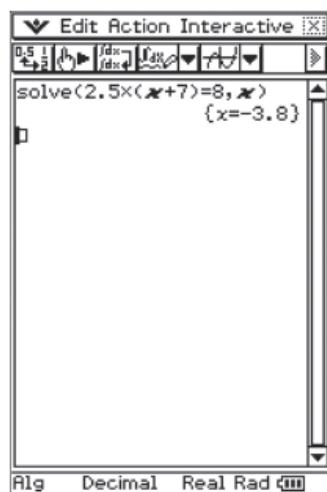
Questions on solving linear equations using a CAS calculator

3   Solve, using the graphics calculator.

   a $0.2x + 6 = 2.4$ b $0.6(2.8 - x) = 48.6$ c $\dfrac{2x + 12}{7} = 6.5$ d $0.5x - 4 = 10$

   e $\dfrac{1}{4}(x - 10) = 6$ f $6.4x + 2 = 3.2 - 4x$

Example: Solving quadratic equations

Solve $2.4x^2 - 1.3x - 18 = 0$.

Solution

Using the TI-Nspire:

1 Select *solve* from the Algebra menu.

2 Type $2.4x^2 - 1.3x - 18 = 0, x)$ then press ⓔⁿᵗᵉʳ or ⓒᵗʳˡ ⓔⁿᵗᵉʳ, depending on the type of solution required.

1.1	RAD EXACT REAL

$\text{solve}\left(2.4 \cdot x^2 - 1.3 \cdot x - 18 = 0, x\right)$

$x = \dfrac{-\left(\sqrt{17449} - 13\right)}{48} \text{ or } x = \dfrac{\sqrt{17449} + 13}{48}$

$\text{solve}\left(2.4 \cdot x^2 - 1.3 \cdot x - 18 = 0, x\right)$

$x = -2.48113881305 \text{ or } x = 3.02280547971$

2/99
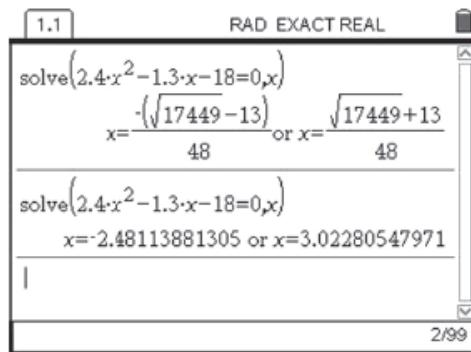
Using the ClassPad:

1 From the Action menu select *solve* from the Advanced submenu.

2 Type $2.4x^2 - 1.3x - 18 = 0, x)$ then press ⓔˣᵉ.

Edit Action Interactive

solve(2.4x^2-1.3x-18=0
{x=-2.481138813, x=3.022
□

Alg   Decimal   Real Rad

Questions on solving quadratic equations using a CAS calculator

5 Use the graphics calculator to solve each of the following equations. Give your answer correct to 2 decimal places.

a $x^2 - 4x - 3 = 0$ b $2x^2 = 4x + 2$ c $3x^2 - 7 = 2x$

Creating tables of values and sketching relations using a CAS calculator

Using the TI-Nspire:

1 Select the Graphs & Geometry application.

2 Type $2x + 3$ into $f1(x)$ then press (enter).

3 Type $x^2 - 2x$ into $f2(x)$ then press (enter). (This will graph both functions.)
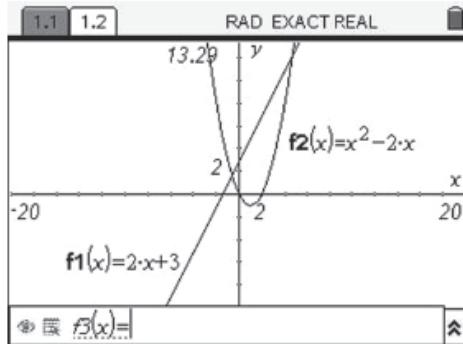
By pressing (menu) then selecting *Window* you are able to set the boundaries of the graph. To insert a table of values press (ctrl) (T).
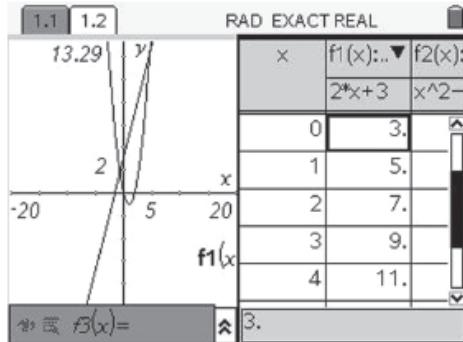
To edit the table settings press (menu) and select *Edit Function Table Settings* from the Function Table submenu. Here you are able to change the starting value of the table and the increments.

Using the ClassPad:

1 Select the Graphs and Tables application by tapping on [Graph&Tab..].

2 Type $2x + 3$ into $y1$ and press (EXE).

3 Type $x^2 - 2x$ into $y2$ and press (EXE).

4 Tap [图] to sketch the two functions.

To set the boundaries of the graph (i.e. the Window settings) tap [图]. To view a table of values tap [图].
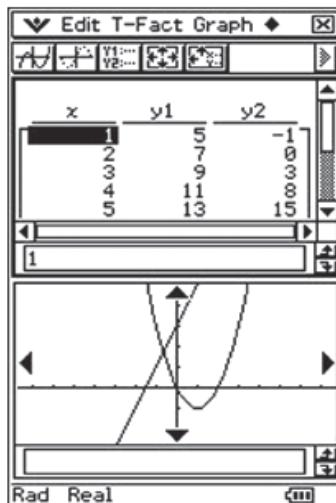
To edit the table settings tap [图].

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Questions on graphing equations using a CAS calculator

2   Use the graphics calculator to graph on the number plane:

a $y = \dfrac{1}{2}x + 1$ b $y = -2 - x$ c $5x + 2y - 10 = 0$

d $y = 3x(x + 2)$ e $y = (x + 2)^2 - 3$ f $y = 5 - 2x^2$

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Example: Solving simultaneous equations

Use the graphics calculator to solve the equations $2x - y = 4$ and $x + 2y = -3$.

Solution

$$2x - y = 4 \ldots\ldots (1) \quad \Rightarrow \quad y = 2x - 4$$
$$x + 2y = -3 \ldots (2) \quad \Rightarrow \quad y = -\frac{1}{2}x - \frac{3}{2}$$

Using the TI-Nspire:

1   Select the Graphs & Geometry application.

2   Type $2x - 4$ into $f1(x)$ then press (enter).

3   Type $-0.5x - 1.5$ into $f2(x)$ then press (enter).
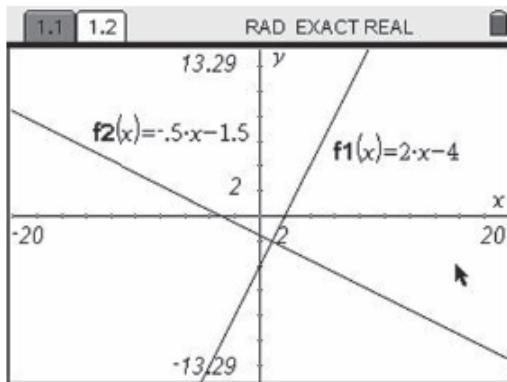
To calculate the point of intersection press (menu) and select *Intersection Point(s)* from the Points & Lines submenu.

Using the ClassPad:

1   Select the Graphs and Tables application by tapping on 📊.

2   Type $2x - 4$ into $y1$ and press (EXE).

3   Type $-0.5x - 1.5$ into $y2$ and press (EXE).

4   Tap 📈 to sketch the two functions.
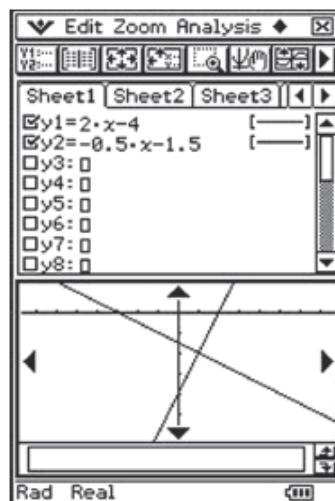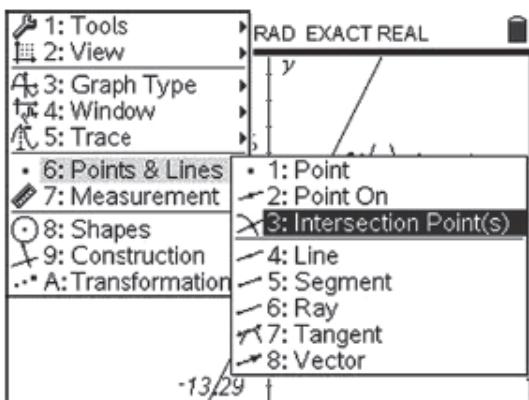
Move the cursor to the point of intersection to display its coordinates.
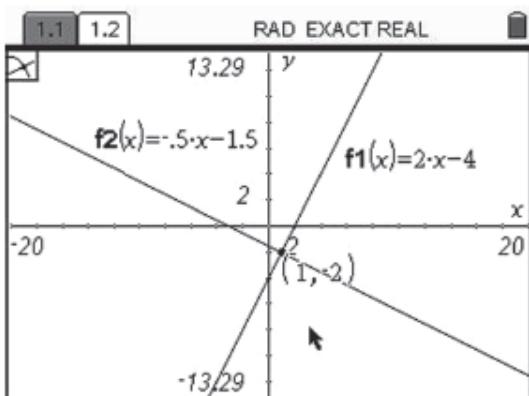
Point of intersection is $(1, -2)$.

To calculate the point of intersection tap Analysis and select *Intersect* from the G-Solve submenu.
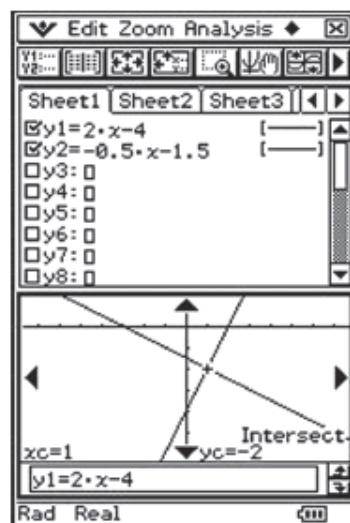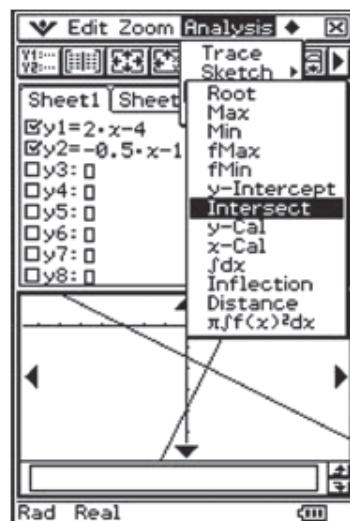
Point of intersection is $(1, -2)$.

Questions on solving simultaneous equations using a CAS calculator

4 Solve the following using technology:

a $y = 2x$
   $y = 3x - 2$

b $3x + y = 4$
   $y = 6 - x$

c $3x + y = 8$
   $x + 2y = 16$

d $y = 2x + 5$
   $y = x^2 + 2x$

e $x + 2y = 5$
   $y = x^2 - 3$

f $y = 5 - x^2$
   $y = 3x^2 - 2x + 1$

Example: Determining quadratic equations

Find the equation of the parabola passing through the points $(1, 5)$, $(4, -4)$ and $(8, 12)$.

Solution

Using the TI-Nspire:

1 Press ⌂ and enter into the Lists & Spreadsheet application.

2 Type the x coordinates **1**, **4** and **8** into the first column.

3 Type the y coordinates **5**, **-4** and **12** into the second column.

4 To highlight both columns move the cursor to the extreme top of column A until it is highlighted. Press and hold the ⇧ key, then press the right arrow key.

5 To perform a Quadratic regression on the highlighted data, press (menu) and navigate as follows: 4:Statistics, 1:Stat Calculations, 6:Quadratic Regression.
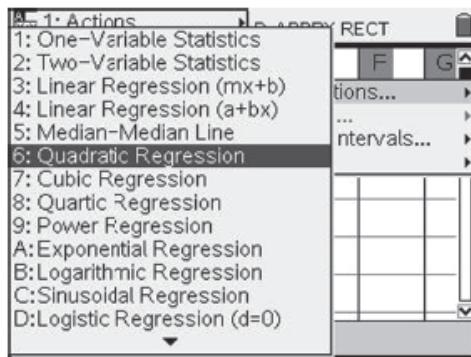
Using the ClassPad:

1 Enter into the Statistics application.

2 Type the x coordinates **1, 4** and **8** into list1.

3 Type the y coordinates **5, -4** and **12** into list2.

4 To perform a Quadratic regression on the data, enter into the Calc menu and then tap Quadratic Reg.

6 Press (enter) twice.

1.1	1.2		RAD APPRX RECT	
A	B	C	D	E
◆			=QuadReg(a[],b	
1.	5.	Title…	Quadratic Reg…	
4.	-4.	Reg…	a*x^2+b*x+c	
8.	12.	a	1.	
		b	-8.	
		c	12.	

D3 =1.0000000000002

7 Ensure the following is set:
XList: list1 and YList: list2.
Tap OK.

Stat Calculation
Quadratic Reg
$y = a \cdot x^2 + b \cdot x + c$

a	=1
b	=-8
c	=12
r^2	=1
MSe	=

OK

OK Cancel

16
Cal▸

[4]=

Deg Auto Decimal

Thus, the equation of the parabola is $y = x^2 - 8x + 12$.

Answers

Linear equation questions

3 a -18 **b** -78.2 **c** 16.75 **d** 28

   e 34 **f** 0.1154

Quadratic equation questions

5 a -0.65 or 4.65 **b** -0.41 or 2.41

   c -1.23 or 1.90

Equation graphing questions
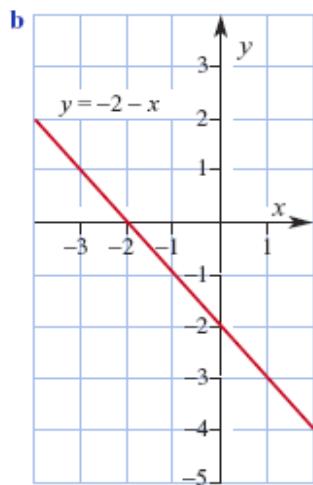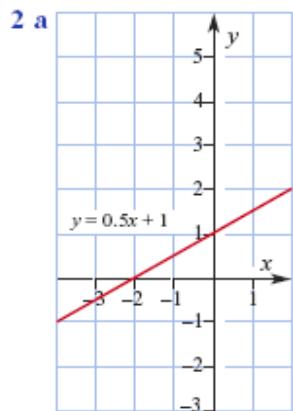
2 a

b

c

$y = -2.5x + 5$

d

$y = 3x(x+2)$

e

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

f

$y = 5 - 2x^2$

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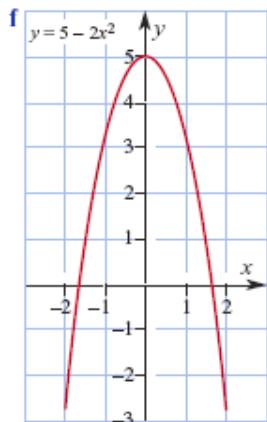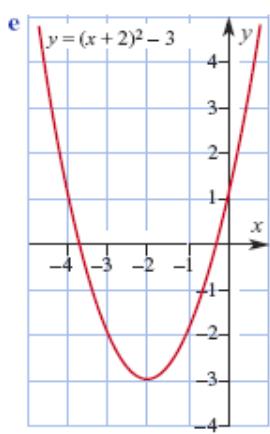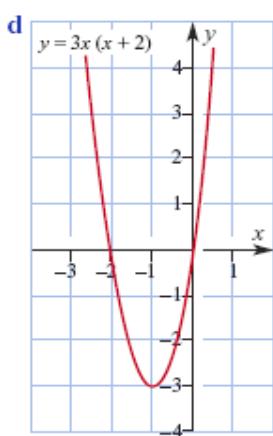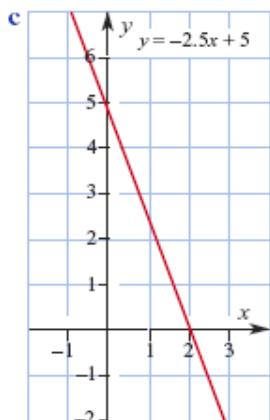
Simultaneous equation questions

4 a $x = 2$ $y = 4$

  b $x = -1$ $y = 7$

  c $x = 0$ $y = 8$

  d $x = -2.236$ $y = 0.528$

   or

   $x = 2.236$ $y = 9.472$

  e $x = -2.608$ $y = 3.804$

   or

   $x = 2.108$ $y = 1.446$

  f $x = -0.781$ $y = 4.390$

   or

   $x = 1.281$ $y = 3.360$