

This resource sheet is designed for use with the Casio fx-CG20. However it can be used with the Casio fx-9860GII or the Casio fx-9750GII although there may be some differences in the key sequences needed and in the screen displays.	
Aim This activity will show you how to graph Integral functions on the calculator. It will the show you how you can use the calculator to calculate areas under graphs. There is also an investigation for students to further explore these ideas.	
Set your calculator to Graph mode. Press MENU 5	MAIN MENU MAIN MENU Run-Matrix Statistics eActivity Spreadsheet Graph Dyna Graph Table Recursion Conic Graphs Equation Program Fiftancial
Delete any existing functions by selecting DELETE on the mini menu bar using F2 F1 .	MathRadNorm1 Real Graph Func Y = Y1: [-] Y2: [-] Y3: [-] Y4: [-] Y5: [-] Y6: [-] SELECT [DELETE] TYPE] TOOL [MODIFY] [DRAW]
You can set the range of the axes by using the viewing window (which is labelled V-Window). Press SHIFT F3	View Window Xmin :-10 max :10 scale:1 dot :0.05291005
Set the range to the standard setting F3 with -10 to +10 with a scale of 1 on both axes. Press EXIT to return to the List screen	Ymin :-10 max :10 [INITIAL][TRIG][STANDRD][V-MEM][SOUARE]
Enter the function $y = 9 - x^2$ into the table. Press EXE	MathlEadNorm1 Real Graph Func :Y= Y1=9-x ² [] Y3: [] Y4: [] Y5: [] Y6: [] SELECT DELETE TYPE TOOL MODFY[DRAW]
Then press Draw F5 on the mini menu bar to draw the graph	BathRadNorm1 Real -9 0 0 9 9



To find the value of $\int_{0}^{+3} 9 - x^2 dx$ we can use the 'G-Solve' function. In the graph screen, press G-Solv SHIFT F5	BethRadNorm Real SV -9 0 3 ROOT MAX MIN Y-ICEPT [INTSECT] ►
Press F6 to get more options and select $\int dx$ F3 and then $\int dx$ F1	MathRadNorm] Real -9 Jdz ROOT (NTSECT)
The screen now displays the graph and is waiting for you to set the lower limit of the integration.	Select lower limit value V1=9-x ² -9 0 9
This can be done by moving the cursor using the right and left scroll keys and then 'fixing' the lower limit by pressing EXE	$X=0$ $\int dx$ $\int dx$ $\int dx$ $\int dx$
Do the same to fix the upper limit.	-9 0 5 x=3.01587β016 9y=-0.0954900478
Press EXE to display the area under the graph and the value of the integration.	MathRadNorm Real 9 0 9 0 LOWER=0 UPPER=0.0158 Jdx=17.9992428 9



You can also find numerical values of integrals in RUN mode. Go to the menu and choose RUN Go to 'Set up' using SHIFT MENU and scroll to Input/output and select 'Math' using F1 on the mini menu bar.	Input/Output:Math Mode :Comp Frac Result :d/c Func Type :Y= Draw Type :Connect Derivative :Off Angle :Rad ↓ Math Line
Press EXE to get back to the RUN screen	
Select MATH using F4	Ecomp (Jeeel Canton Control Canton Control Con
Press F6 to get more options and select $\int dx$ F1	MAT 1052b Abs d/dxdx2
Enter the values for $\int_{0}^{+3} 9 - x^2 dx$ using the cursor keys to navigate between the function to be integrated and the limits.	Jdx X ▷ MathRadNorm3 d/cReal ∫_□dx
	$\int dx X \qquad \square$ $\frac{\int dx X \square}{\int_{0}^{3} (9-x^{2}) dx}$
Press EXE to show the result.	$\int dx \Sigma \qquad \qquad$
You will see that the calculator has now calculated the value of the integral which is 18	18
Question	ſdx Σ(
What do you think the value of $\int_{-3}^{+3} 9 - x^2 dx$ will be? Check your answer by drawing the graph in the same way as before.	



Hint On the fx-CG20 you can also plot graphs in RUN mode Set your calculator to RUN mode. Press WEN 1Image: Comparison of the first set of the		
Go to 'Set up' using [SHIFT] MENU and scroll to Input/output and select 'Linear' using [\mathbf{F}_{2} on the mini menu bar. Press [\mathbf{E} XII) to return to the Run screen To draw the Integral graph of $\int_{0}^{13} 9 - x^{2} dx$ This involves the following stages: Clear the screen [SHIFT] [\mathbf{F}_{4} [\mathbf{F}_{1} to get to Cls, then [\mathbf{E} E]. To get the Integral graph function press [SHIFT] [\mathbf{F}_{4} to get 'Sketch'. Then [\mathbf{F}_{5} for 'Graph', and then [\mathbf{F}_{5} for G. $\int dx$ and then enter $9 - x^{2}$ (\mathbf{O} (\mathbf{F}_{4}) ($\mathbf{O} = \mathbf{A}^{2}$), \mathbf{O} , 3 [\mathbf{E} KE]. The Integral graph function is always entered in the same sequence – the integral graph, the function, followed by a comma, the lower limit, a comma and then the upper limit Press [\mathbf{E} Ke to show the graph. You will see that the calculator has also calculated the value of the integral – in this case 18 Why is this a more accurate way of calculating the value of the integral than the graphing method given at the start of this	On the fx-CG20 you can also plot graphs in RUN mode	Mode :Comp Frac Result :d/c Func Type :Y= Draw Type :Connect
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Questions

What do you think the value of $\int_{-3}^{+3} 9 - x^2 dx$ will be? Check your answer by drawing the graph in the same way as before. What do you think the value of $\int_{2}^{+6} 9 - x^2 dx$ will be? Go on – be brave and make an estimate. Explain your reasoning. Now draw the graph and check. If the guestion had asked for the area bounded by the curve and the x-axis between x = -3 and x = 6 what would the answer have been and why is this different to the previous question? What do you think the value of $\int_{0}^{+6} 9 - x^{2} dx$ is going to be? Check your answer by drawing the graph, but you will have to clear the screen first and re-enter the expression. What do you think the value of $\int_{3}^{+6} 9 - x^2 dx$ is going to be? Now draw the graph to check it. What do you think the value of $\int_{-6}^{+6} 9 - x^2 dx$ is going to be? This should be easy now - but check it just to make sure! Investigation Find the area bounded by the curve y = (x + 1)(x - 5) and the for -1 < x < 5. Find the value of a for which: $\int_{-1}^{+a} (x+1)(x-5)dx = 0$ Find the area bounded by the curve y = (x + 1)(x - 5) and the line y = -1Check your answer by solving the same problem using algebraic methods.