

# Chapter 10 / Example 2

## Graphing a function and its derivative

For each of the functions below:

- i find  $f'(x)$
- ii find the gradient of the curve at the point where  $x = 2$
- iii sketch the graph of the function and its derivative on the same axes
- iv write down the set of values of  $x$  for which the function is increasing.

**a**  $f(x) = 2x^2 + 3x - 5$       **b**  $f(x) = \frac{2}{x} + x, x \neq 0$

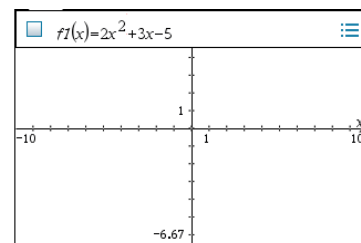
Open a new document and add a Graphs page.

The entry line is displayed at the top of the work area.

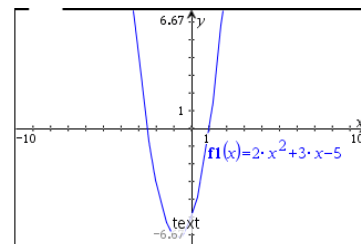
The default graph type is function, so ' $f1(x)=$ ' is displayed.

The default axes are  $-10 \leq x \leq 10$  and  $-6.67 \leq y \leq 6.67$ .

Type  $2x^2 + 3x - 5$  and press **enter**.



The GDC displays the graph  $f1(x) = 2x^2 + 3x - 5$  with the default axes.

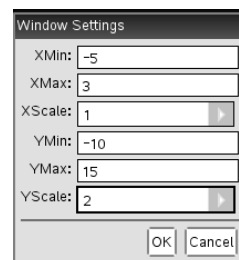


For a better view of the curve, adjust the window.

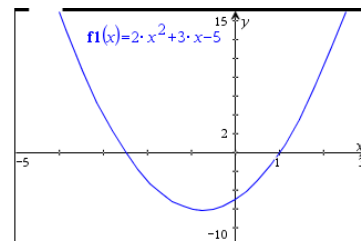
Press **menu** 4:Window/Zoom | 1:Window Settings...

Set the axes to show  $-5 \leq x \leq 3$  with a scale of 1 and  $-10 \leq y \leq 15$  with a scale of 2

Press **enter** when you have finished.



The GDC displays the graph with suitable axes.



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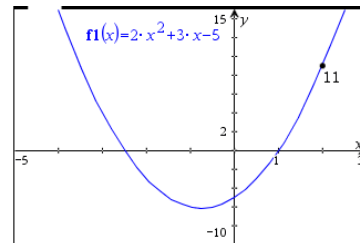
# Graphing a function and its derivative

To find the gradient of the curve at the point where  $x = 2$  press **menu** 6:Analyse Graph | 5:dy/dx

Type 2, the value of the  $x$ -coordinate, and press **enter** **del**

The GDC displays a point on  $f(x) = 2x^2 + 3x - 5$  and the gradient of the curve at that point.

$$f'(2) = 11.$$

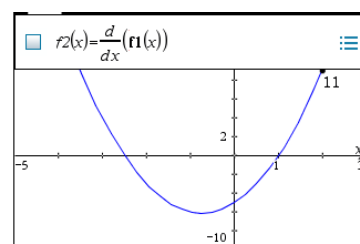


To display the graph of the derivative press **tab** to display the entry line again. This time 'f2(x)=' is displayed.

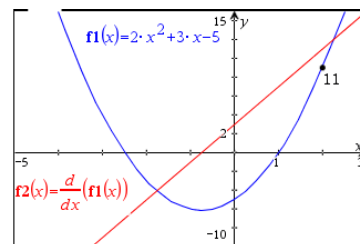
Press **math** and select  $\frac{d}{dx}$

Type X in the denominator and type the function f1(x)

Press **enter**.



The GDC displays the graph of  $f1(x)$  and its derivative.



To find where the function is increasing, either find its minimum value or the zero of the derived function.

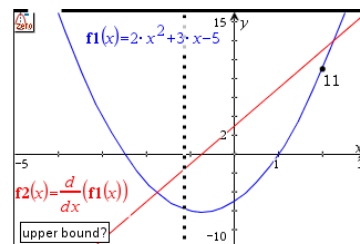
To find the zero press **menu** 6:Analyse Graph | 1:Zero

Choose the graph f2(x) with the touchpad.

You will need to give the lower and upper bounds of the region that includes the zero.

The GDC shows a line and asks you to set the lower bound. Move the line using the touchpad and choose a position to the left of the zero.

Click the touchpad.



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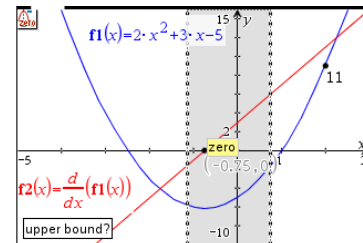
# Graphing a function and its derivative

The GDC shows another line and asks you to set the upper bound.

Use the touchpad to move the line so that the region between the lower and upper bounds contains the zero.

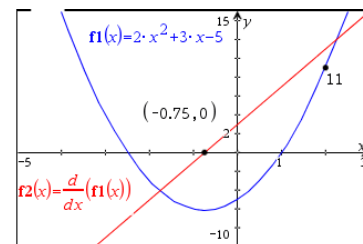
When the region contains the zero, the calculator will display the word 'zero' in a box.

Click the touchpad.



The zero of  $f'(x)$  is at  $-0.75, 0$

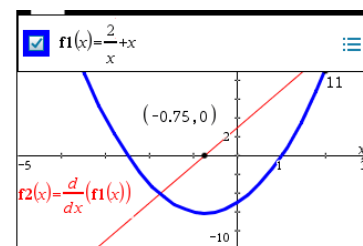
The function is increasing where  $x > -0.75$ .



Press **tab** to display the entry line again. Scroll back up to display ' $f1(x)=$ '.

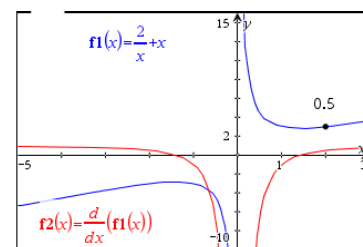
Edit the function and change it to  $\frac{2}{x} + x$  and press .

Use the fraction template   ()



The GDC displays the function  $f1 \ x = \frac{2}{x} + x$ , its derivative and the gradient at the point where  $x = 2$ .

$$f' 2 = 0.5$$



$f(x)$  has a maximum and minimum point at  $(-1.41, -2.83)$  and  $(1.41, 2.83)$ .

The function is increasing when  $x < -1.41$  and  $x > 1.41$

