

Applications of Differentiation

Each of the questions included here can be solved using either the TI-Nspire CAS.

Scan the QR code or use the link:

Question 1:

Find the derivative of $10x(1-x)^9$ with respect to x .

Question 2:

Consider the function $f(x) = x^3 - 2x^2 - 4x - 16$. Find the interval for which $f'(x) < 0$.

Question 3:

Find the equation of the tangent to the curve $g(x) = \frac{1}{2}e^{1-x} - 3$ at the point where $x = 1$

Question 4:

Find the equation of the tangent to the curve $h(x) = \cos(2x)$ at $x = \frac{\pi}{4}$

Question 5:

Find the average rate of change of the function $f(x) = x^4 - 3x^3 + 5x$ between $x = 1$ and $x = 3$

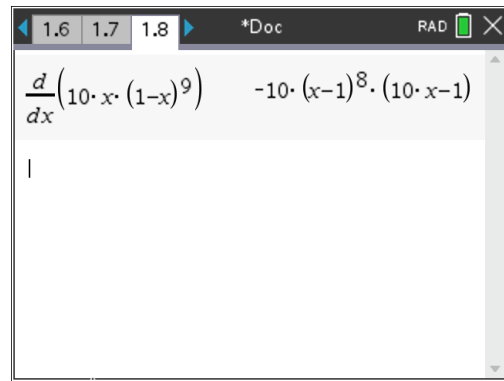
Answers

Question 1

$$10(1-x)^8(1-10x) \text{ or } -10(x-1)^8(10x-1)$$

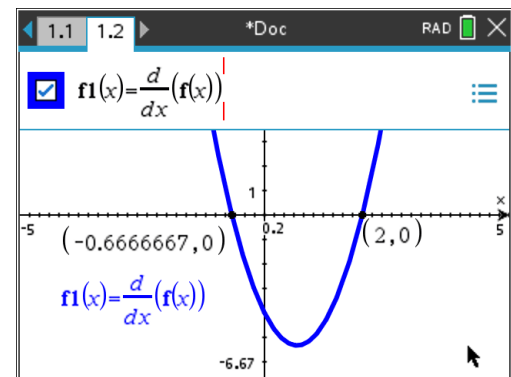
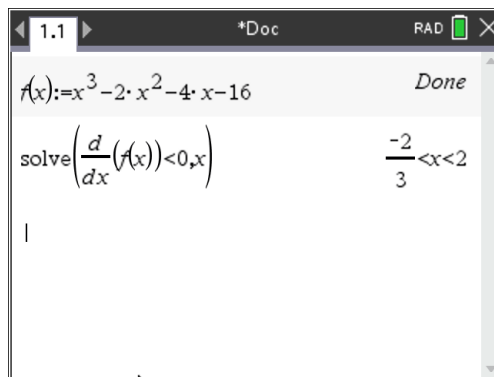
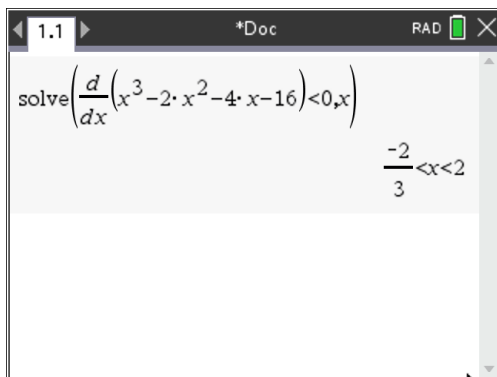
Use the derivative function. This can be accessed via menu > 4: Calculus > 1: Derivative.

The shortcut for the derivative function is SHIFT -



Question 2

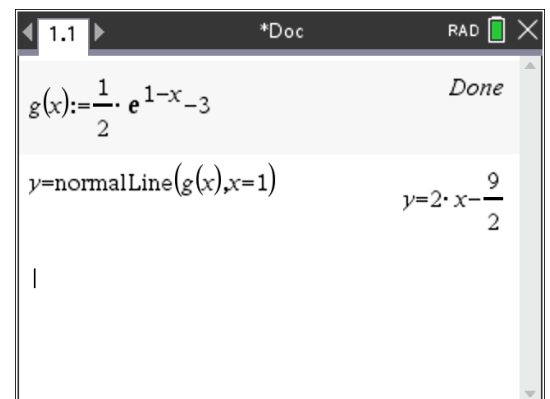
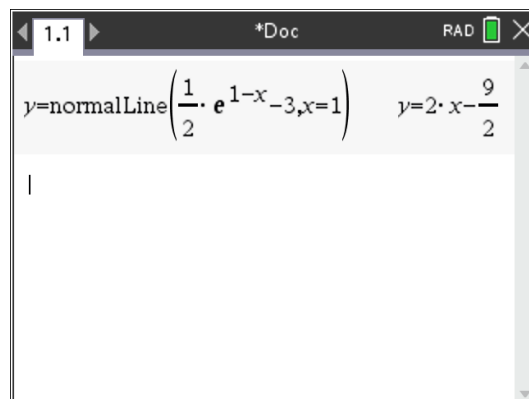
$$-\frac{2}{3} < x < 2 \text{ Or } x \in \left(-\frac{2}{3}, 2\right)$$



Question 3

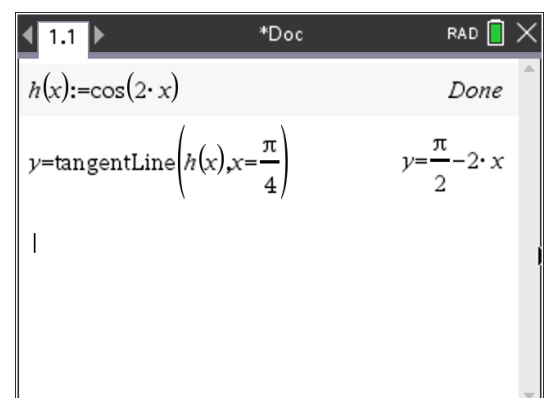
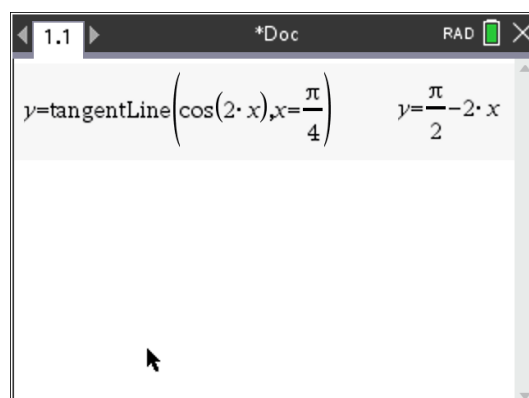
$$y = 2x - \frac{9}{2}$$

Menu > 4: Calculus > A: Normal Line



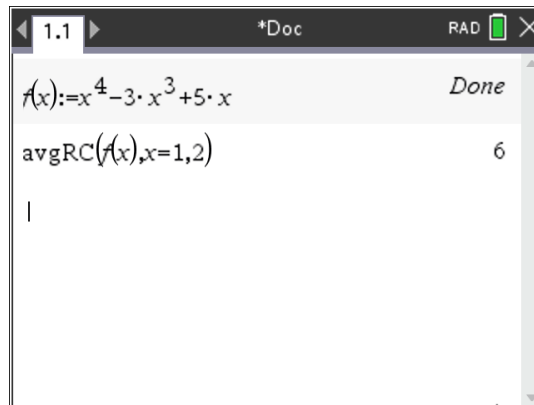
Question 4

$$y = -2x + \frac{\pi}{2}$$

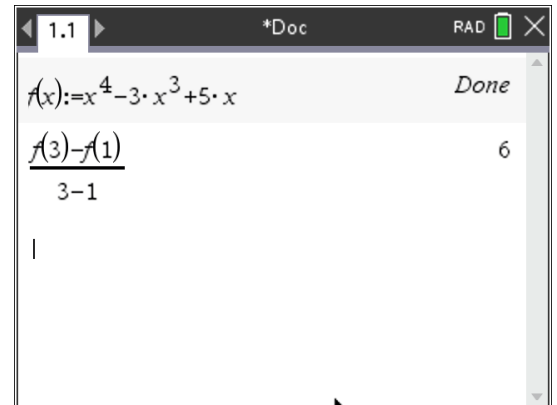


Question 5

6



A screenshot of a TI-84 Plus calculator window. The title bar shows '1.1', '*Doc', 'RAD', and a close button. The main display area contains the following text: $f(x) := x^4 - 3 \cdot x^3 + 5 \cdot x$ followed by 'Done'. Below that, the command $\text{avgRC}(f(x), x=1, 2)$ is entered, followed by the result '6'. A vertical cursor is positioned below the result.



A screenshot of a TI-84 Plus calculator window. The title bar shows '1.1', '*Doc', 'RAD', and a close button. The main display area contains the following text: $f(x) := x^4 - 3 \cdot x^3 + 5 \cdot x$ followed by 'Done'. Below that, the expression $\frac{f(3) - f(1)}{3 - 1}$ is entered, followed by the result '6'. A vertical cursor is positioned below the result.

Note: if using the Average Rate of Change command avgRC, the syntax is avgRC(expression, value, step). For two points (x_1, y_1) and (x_2, y_2) that is avgRC(f(x), x_1 , $x_2 - x_1$)

The step is the difference between x_2 and x_1