

Points of Intersection and Zeros of Functions

by

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Textbook Correlation: Key Topic

- Pre-Requisites: Functions and Equations

NCTM Principles and Standards:

- Process Standard
 - Representation
 - Connections

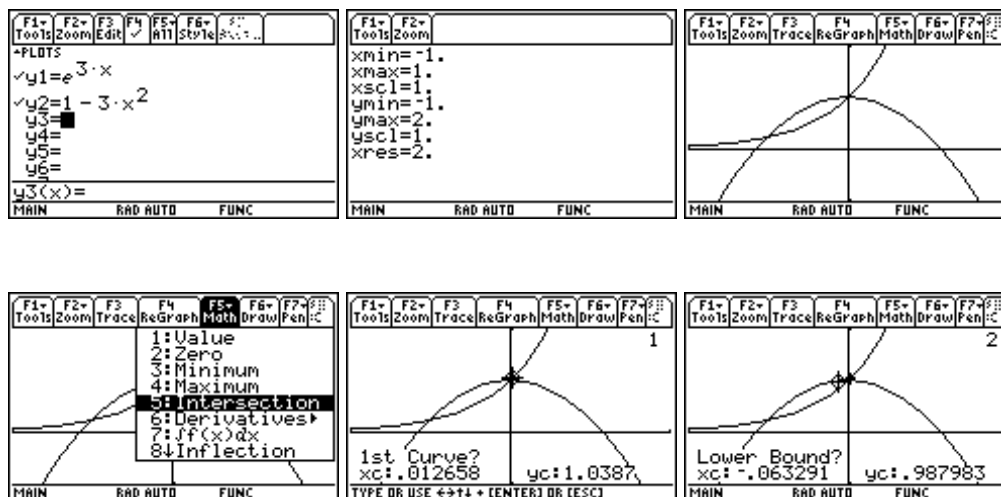
Exercises:

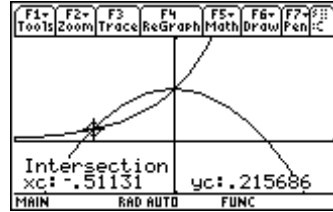
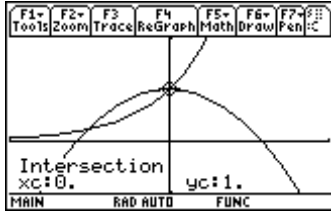
1. Solve $e^{3x} = 1 - 3x^2$.

Answer:

Method I

- a. Graph $y_1(x) = e^{3x}$ and $y_2(x) = 1 - 3x^2$. Find the points of intersection of $y_1(x)$ and $y_2(x)$. Reproduce the screens below on your TI-89 (TI-92 Plus).





Comment: $x = 0$ is an exact solution. $X = -.51131$ is an approximate solution.

- b. To solve numerically, look at the table to find the values of x where $y_1(x) = y_2(x)$. You can also verify the values on the Home Screen.

x	y1	y2
0.	1.	1.
1.	20.086	-2.
2.	403.43	-11.
3.	8103.1	-26.
4.	1.63E5	-47.

■ solve($e^{3x} = 1 - 3x^2, x$)	
x = 0. or x = -.51131	
■ y1(0)	1
■ y2(0)	1
■ y1(-.51131)	.215686
■ y2(-.51131)	.215686
y2(-.51131)	

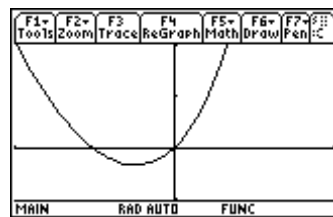
- c. Use the **solve** command on the Home Screen to solve symbolically (algebraically).

■ solve($e^{3x} = 1 - 3x^2, x$)	
x = 0. or x = -.51131	
solve($e^{(3x)}=1-3x^2,x$)	

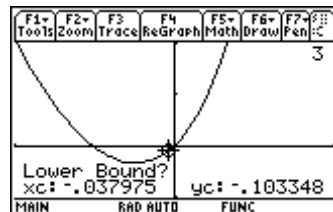
Method II

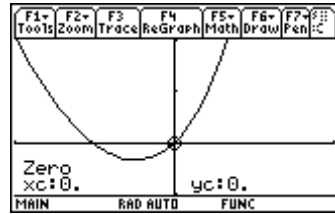
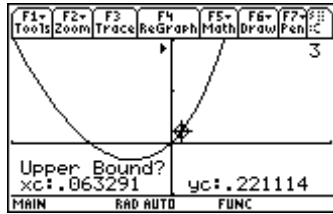
- a. Graph $y_3(x) = e^{3x} - (1 - 3x^2)$. Find the zeros of $y_3(x)$.

+PLTBS	
y1= e^{3x}	
y2= $1 - 3x^2$	
y3=y1(x)-y2(x)	
y4=	
y5=	
y6=	
y3(x)=y1(x)-y2(x)	



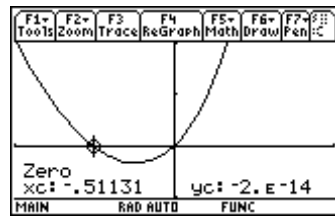
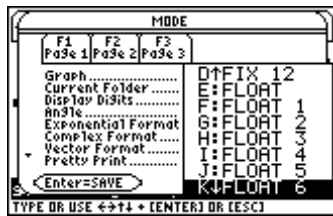
1: Value
2: Zero
3: Minimum
4: Maximum
5: Intersection
6: Derivatives
7: f(x)dx
8: Inflection



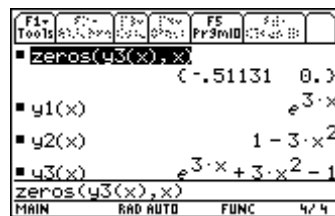


Repeat the procedure to approximate the zero at $x \approx -.51131$

Note: The number of display digits in fixed or floating point is selected with the **MODE** key. Float 6 is the default.



- b. Follow the procedures depicted in Method I for the numerical analysis using the **Table**.
- c. Use the **solve** command on the Home Screen for the symbolic analysis. Alternatively, press **F2** (Algebra), **4:zeros(** and enter the function on the Home screen as illustrated below.



Additional Exercise:

Solve $x^3 = 3x + 2$ graphically, numerically and analytically.