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

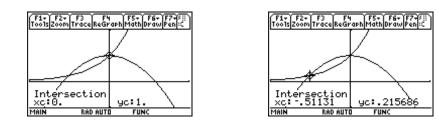
Answer:

Method I

a. Graph $y1(x) = e^{3x}$ and $y2(x) = 1 - 3x^2$. Find the points of intersection of y1(x) and y2(x). Reproduce the screens below on your TI-89 (TI-92 Plus).

F1+ F2+ F3 F4 F5+ F6+ SU ToolsZoomEdit / All Style Store	F1+ F2+ Tools Zoom	F1+ F2+ F3 F4 F5+ F6+ F7+ ⁵ ;; Too1sZoomTraceReGraphMathDrawPen;C
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√y2=1 - 3·× ² y3 = y <u>4</u> =	xsc1=1. ymin=-1. ymax=2. ysc1=1.	
95= 96= 93(x)=	xres=2.	
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F1+ F2+ F3 F4 F5+ F6+ F7+5:: ToolsZoomTraceReGraphMathDrawPen:C	F1+ F2+ F3 F4 F5+ F6+ F7+S: Too1sZoomTraceReGraphMathDrawPen:C	F1+ F2+ F3 F4 F5+ F6+ F7+8: ToolsZoomTraceReGraphMathDrawPeni<	
1:Value 2:Zero	1	2	
3:Minimum 4:Maximum 38 magnagasion			
6:Derivatives			
84Inflection	1st Curve? xc:.012658 yc:1.0387	Lower Bound? xc:063291 yc:.987983	
MAIN RAD AUTO FUNC	TYPE OR USE €→†↓ + CENTER3 OR CESC3	MAIN RAD AUTO FUNC	

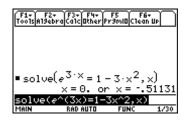


Comment: x = 0 is an exact solution. X = -.51131 is an approximate solution.

b. To solve numerically, look at the table to find the values of x where y1(x) = y2(x). You can also verify the values on the Home Screen.

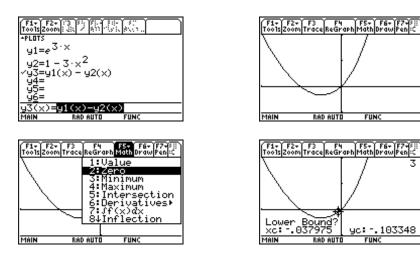
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Θ.	1.	1.		$\times = 0.$ or $\times =51131$		
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2.	403.43	-11.		■ y2(0)	1	
3.	8103.1	-26.		■ y1(51131)	.215686	
4.	1.63E5	-47.				
				■ y2(51131)	.215686	
×=0.				y2(51131)		
MAIN	RAD AUT	O FUN	c	MAIN RAD AUTO	FUNC 5/30	

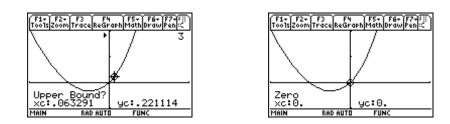
c. Use the **solve** command on the Home Screen to solve symbolically (algebraically).



Method II

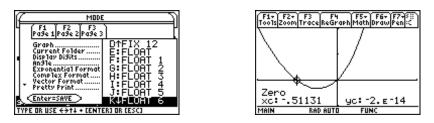
a. Graph $y_3(x) = e^{3x} - (1 - 3x^2)$. Find the zeros of $y_3(x)$.



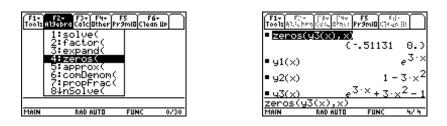


Repeat the procedure to approximate the zero at $x \approx -.51131$

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