Topics in Calculus: Applications of Derivatives

Visualizing Related Rate Problems

NCTM Principles and Standards

- **Content Standard:** Represent and analyze mathematical situations and structures using algebraic symbols
- **Process Standard**: Use representations to model and interpret physical, social, and mathematical phenomena

When the variables that model a problem can be written as functions of time (t) the relationships may be visualized by graphing using parametric mode on the TI-89. Let's look at the old stand-by sliding ladder problem from a new perspective!

A 5 m ladder is leaning against a wall. The base of the ladder is being pulled away at a rate of 2m/sec. How fast is the top of the ladder moving down the wall when the base of the ladder is 3m from the wall?

 To graph the problem first change to parametic mode by pressing MODE () [2]
 ENTER].

MODE N					
F1 F2 F3 Pa9e 1 Pa9e 2 Pa9e 3					
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Enter=SAVE	(ESC=CANCEL)				
TYPE OR USE ++++ CENTERI OR CESCI					

Press → F1 and enter the parametric equations for x and y. Enter xt2, yt2, xt3, and yt3 as shown below. Press [F6] (2nd F1) (2) to select the dot style.

F1-	F2+ 1:13 33; F1+ 53+ 52+
Tools	Zoom(: 3:1 ≠ 1833 S2+34 s**:
*PLOT	s
MXt:	1=2·t
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≤xt:	2=xt1(t)
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xt3•	(t)=0
MAIN	BAD AUTO PAR

F1- Tools	F2+ 200m	F3 Edit	F 5	F5- 811	Style		\square		
*PLOTS									
$v_{gt1} = 25 - (2 \cdot t)^2$									
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- Turn off the x and y axes. Make sure the TI-89 has the grapher open. Press F1 and

 to go down to choice 9 (Format) on the menu or press
 . Once the format screen is open press
 to move down to the 4th line and press ENTER. Select axes off and press ENTER.
- Press F2 and set the window as shown.

- Put the TI-89 in simultaneous mode by pressing F1 and ⊙ to go down to choice 9 (Format) on the menu or press ⑨ or simply use the shortcut keys ●1 to go directly to the format screen. Once the format screen is open press ⊙ to move down to the 2nd line and press ENTER. Select SIMUL and press ENTER.
- Press ●F3 to graph the parametric equations. Press ENTER to pause the graph and press ENTER to resume graphing. Notice the spacing of the dots. The distance between them is the rate of change per unit of time! Press F3()/() to trace the parametric equations. Press ⓒ/() to switch among the equations.







