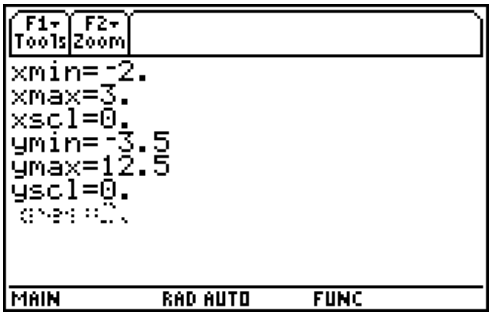
Name _____

Class _____

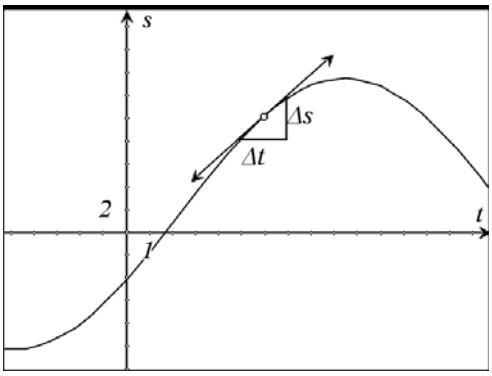
Part 1 – Extreme Cyclist

Press ◆ + [Y=]. Select **F1:Tools > 8:ClearFunctions**. In **y1**, type the expression **$8.8+6x-16x^2|0\le x\le 0.95$**. While the function is highlighted, select **F6:Style > 6:Path**. Press ◆ + [WINDOW] and change the window settings to match those on the right. Then, press ◆ + [GRAPH]. The animation represents the position of an extreme bicyclist as he jumps off of a ledge and lands safely on the ground.



1. Is the extreme bicyclist's initial velocity positive, negative, increasing, or zero? How do you know?

Let *s* = position. The definition for average velocity is the change in position divided by the time interval. Graphically, the instantaneous velocity is the slope of the tangent.



2. Using the position graph, what is the average velocity from 0 to 0.95 seconds? Show your work.

3. Using position function $s(t) = 8.8 + 6t - 16t^2$, find the velocity when the time is 0.5 seconds. Show your work.

Check your answer graphically. On the HOME screen, start the program *tanimat2* by typing **tanimat2()** and pressing [ENTER]. Once the program begins, select **Interactive** from the first menu and press enter. Then, enter 1 (you will need to press [alpha] + 1) and select **TANGENTS ONLY**. Type in 0.5 and press [ENTER] twice. The slope of the function at $x = 0.5$ will appear on the screen.

4. Using Calculus, express the velocity of the extreme bicyclist as a function of time. Enter your function in **y1**.

5. What is the acceleration when $t = 0.1875s$? Check your answer using the *tanimat2* program using the same process as before.

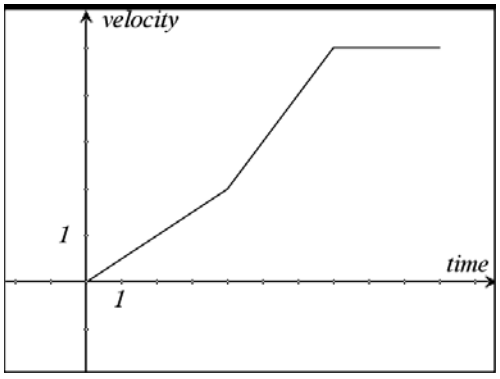
6. Describe the velocity of the extreme cyclist. Explain you reasoning.

7. When is the extreme cyclist's speed positive?

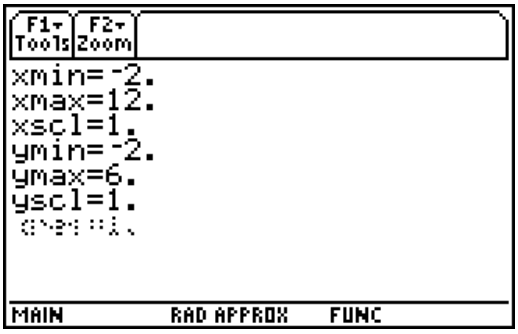
8. Why is the extreme cyclist's speed increasing when $t = 0.2s$?

Part 2 – Predict the Graph

9. For the position graph below, give a correct interpretation of the graph of distance versus time provided. Also, use this space to sketch your prediction of what the corresponding velocity-time graph looks like.



Enter the following position-time function in **y1**: **when(x≤4,0.5*x,when(x≤7,x–2,5))**.

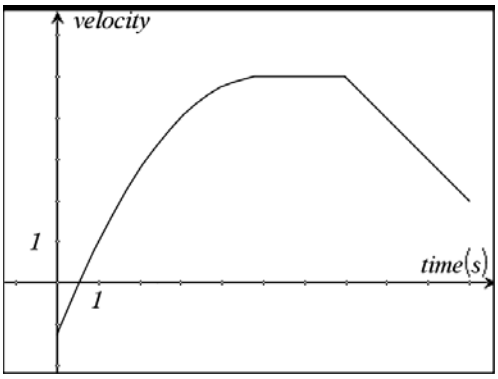


Change the window settings to match those on the right**,** then go back to the HOME screen and start the *tanimat2* program. In the Main Menu, select **2:Animated**, then select **LOW** sampling rate, and display **TANGENT&PTS**. Next, type 0 and press ENTER twice, and then type 10 and press ENTER twice. The velocity-time graph will be traced out on your calculator. You can trace along the velocity-time graph by pressing the left and right arrows.

10. Describe the motion of the object.

Now, enter the following velocity-time function in **y1**: **when(x≤5,–0.25*(x–5)^2+5,when(x≤7,5,–x+12))**

On the right, sketch your prediction of the corresponding acceleration-time graph for the given velocity-time graph. Go to the HOME screen and start the *tanimat2* program and repeat the process from above. Does your prediction match?



11. When t = 5 s, does acceleration exist? Why?

12. When t = 7s, does acceleration exist? Why?