Calculus Grapher for Math

Learning Goals: Students will be able to:

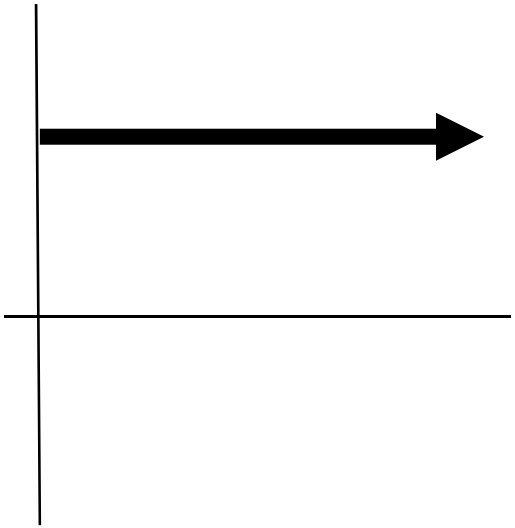
- Given a function sketch the derivative or integral curves
- Explain what the effect of a discontinuity in a function has on the derivative and the integral curves
- Explain the difference between smooth versus piecewise continuous function curve
- Be able to describe in words with illustrations what the derivative and integral functions demonstrate

Open ***Calculus Grapher before starting class introduction***
Open ***Calculus Grapher before starting and Moving Man before starting clicker questions***

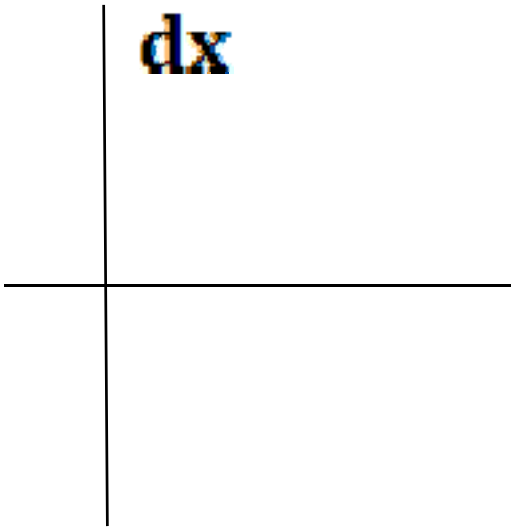
Trish Loeblein and Mike Dubson July 2009 to see course syllabi :
http://jeffcoweb.jeffco.k12.co.us/high/evergreen/science/loeblein/phys_syl/syllabus_p.html

Given this function, talk with your group about what you think the derivative and integral curves will look like and sketch

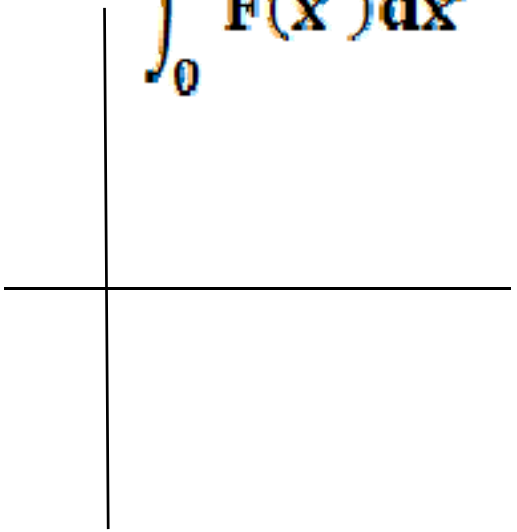
F(x)

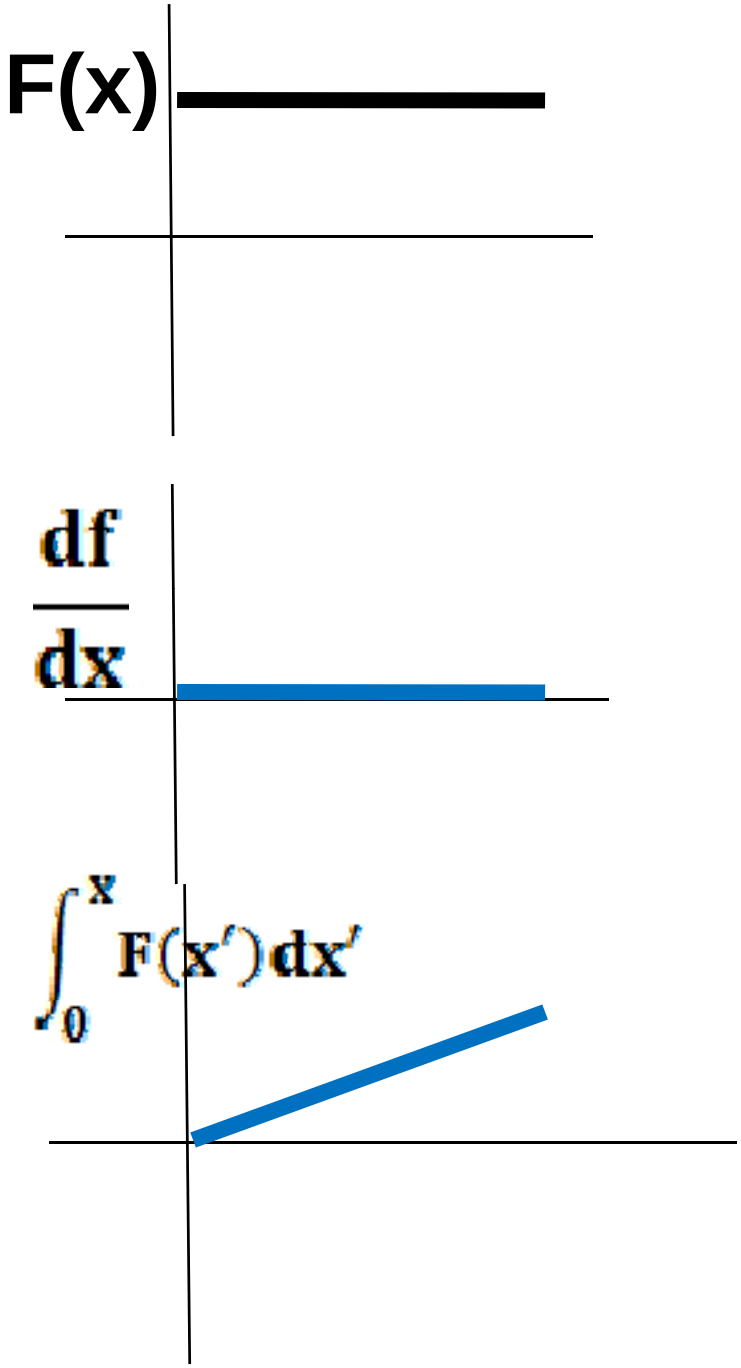


$$\frac{df}{dx}$$



$$\int_0^x F(x')dx'$$





answer

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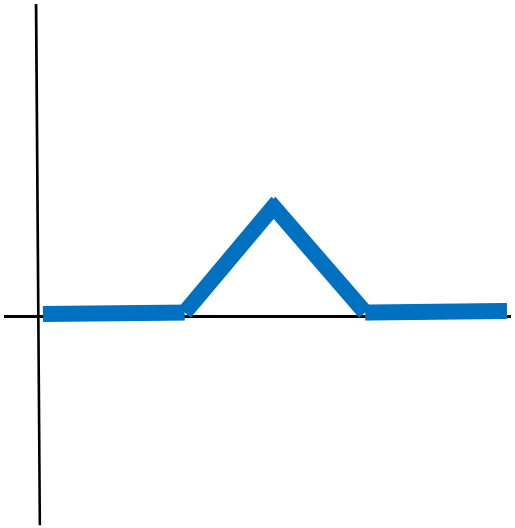
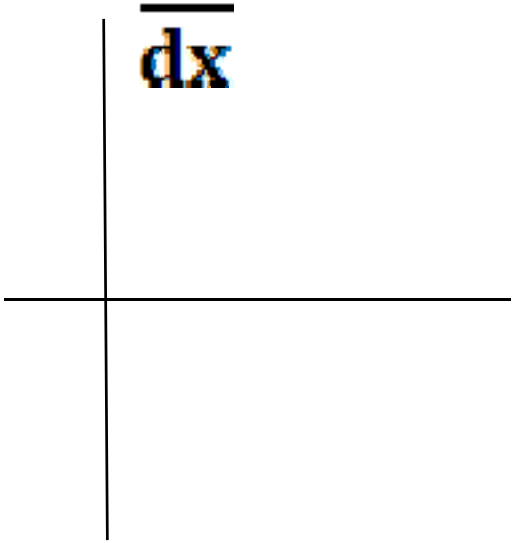
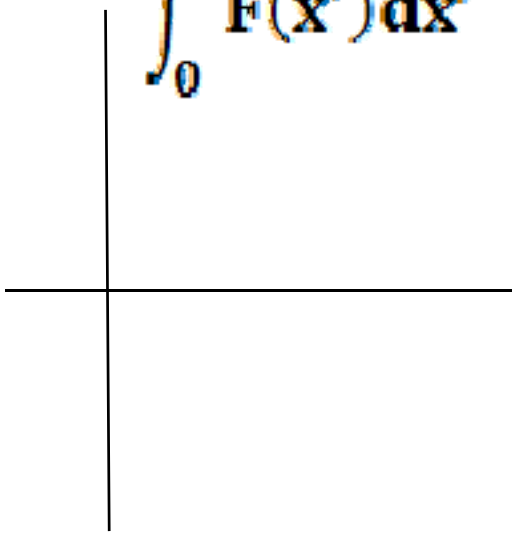
F(x)

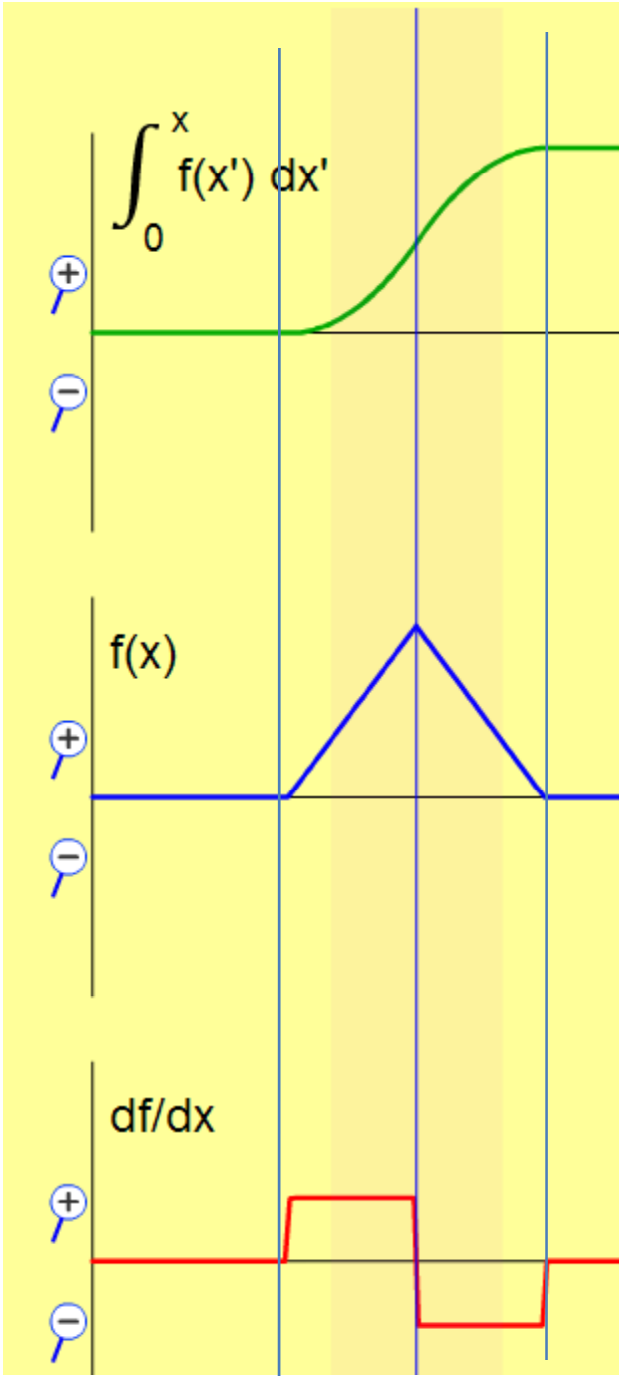


$\frac{df}{dx}$



$\int_0^x F(x')dx'$



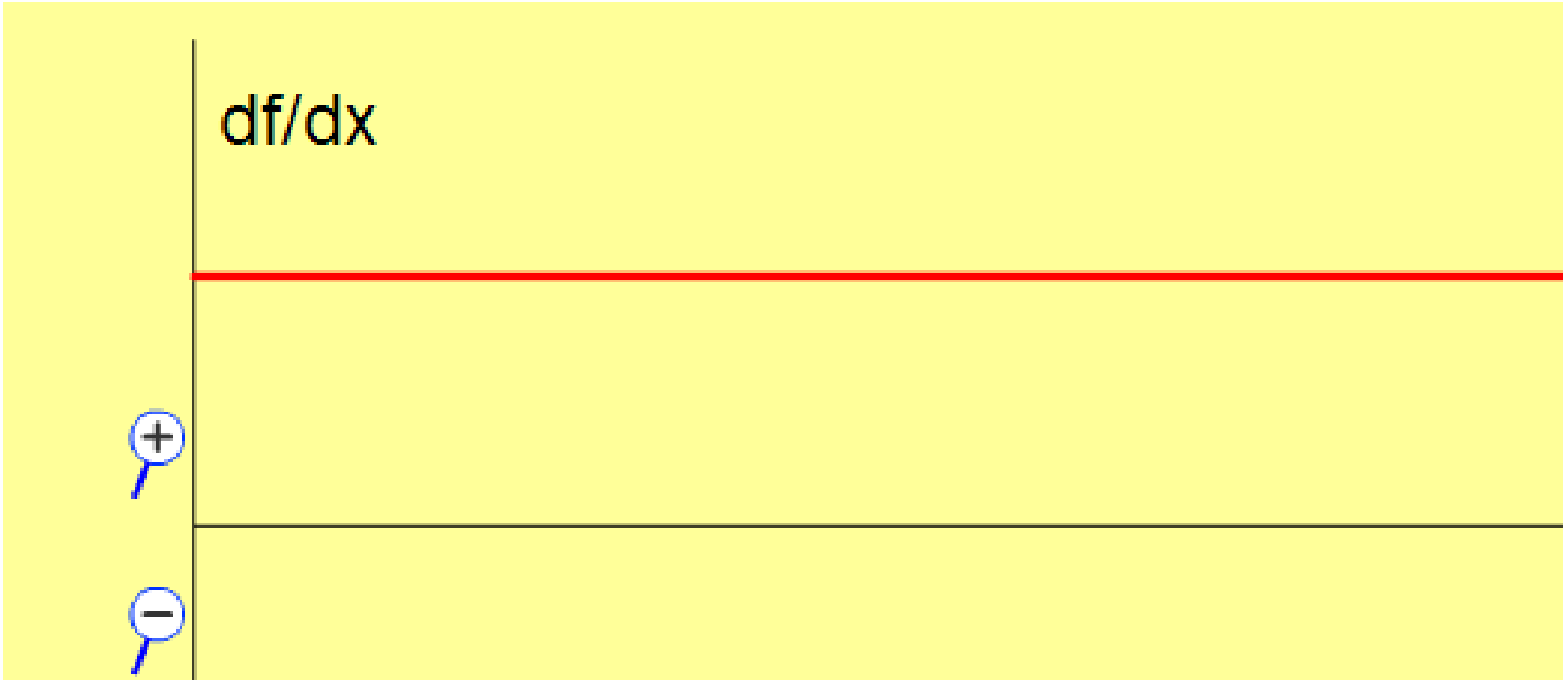


ZOOMED
integral graph
only

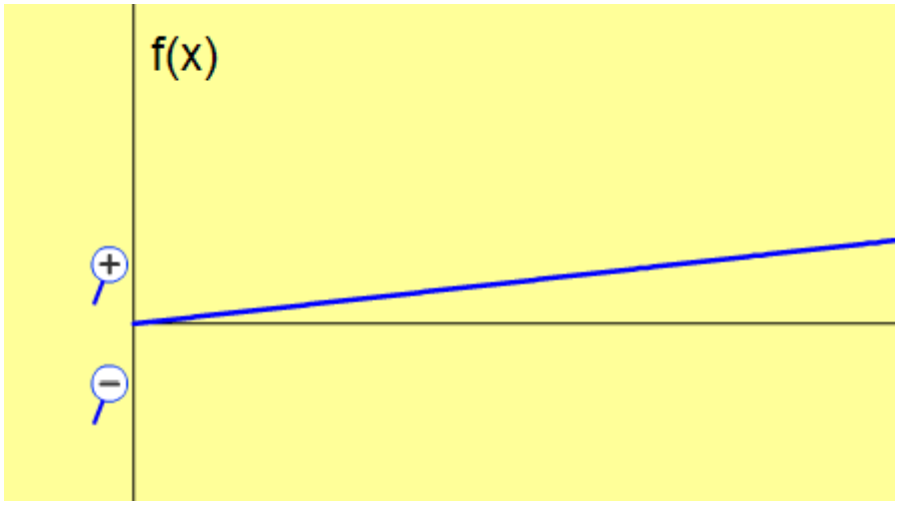
answer

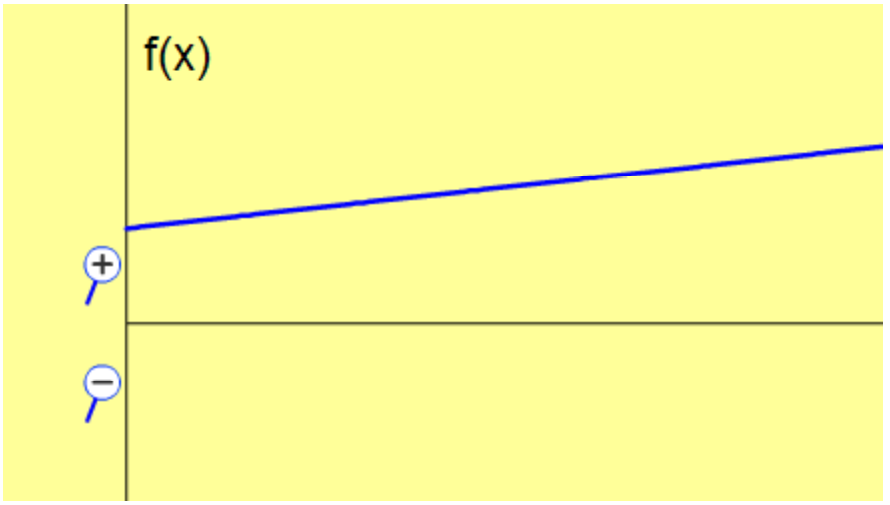
Post lesson slides start here

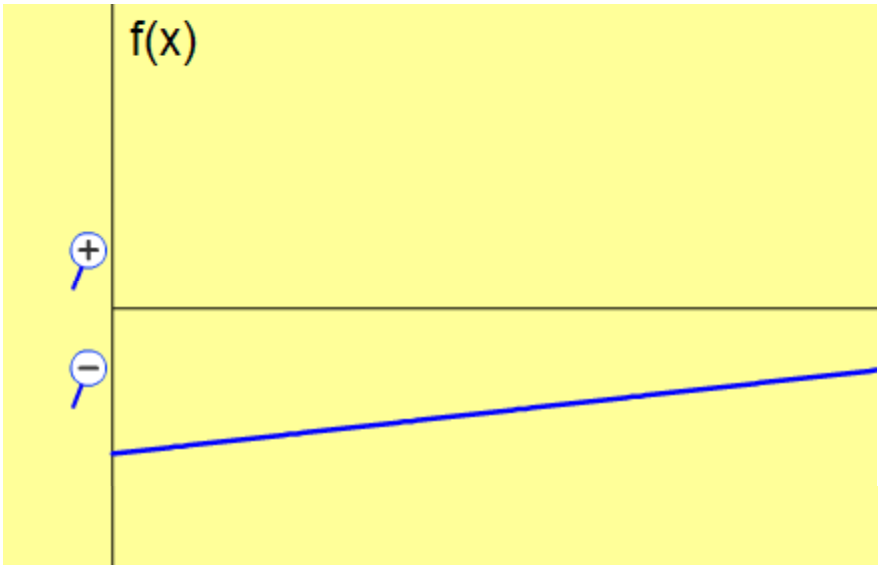
What does the function of this graph look like?

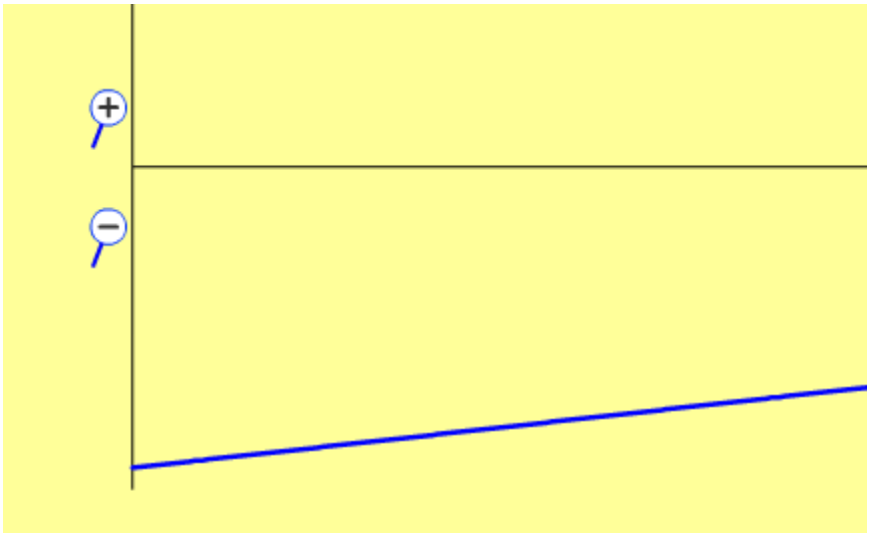


Possible answers

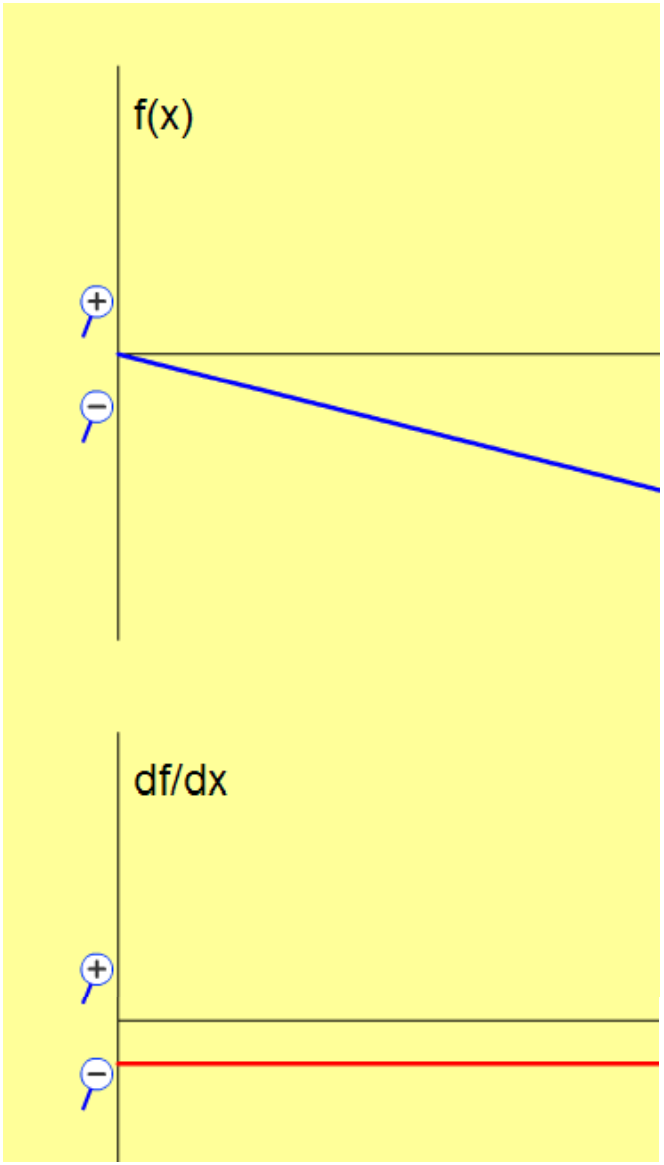


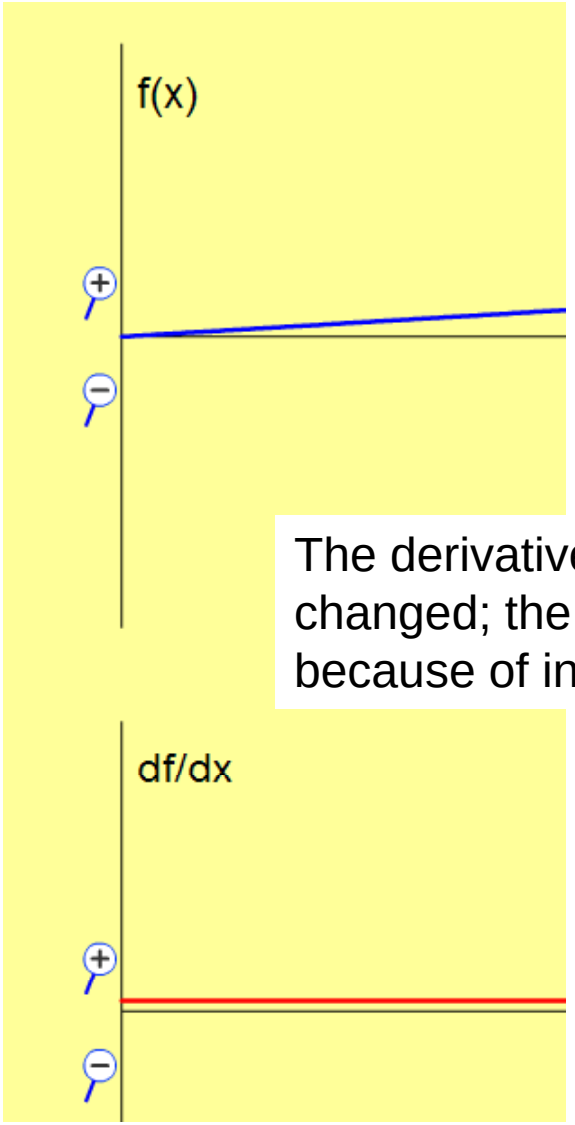






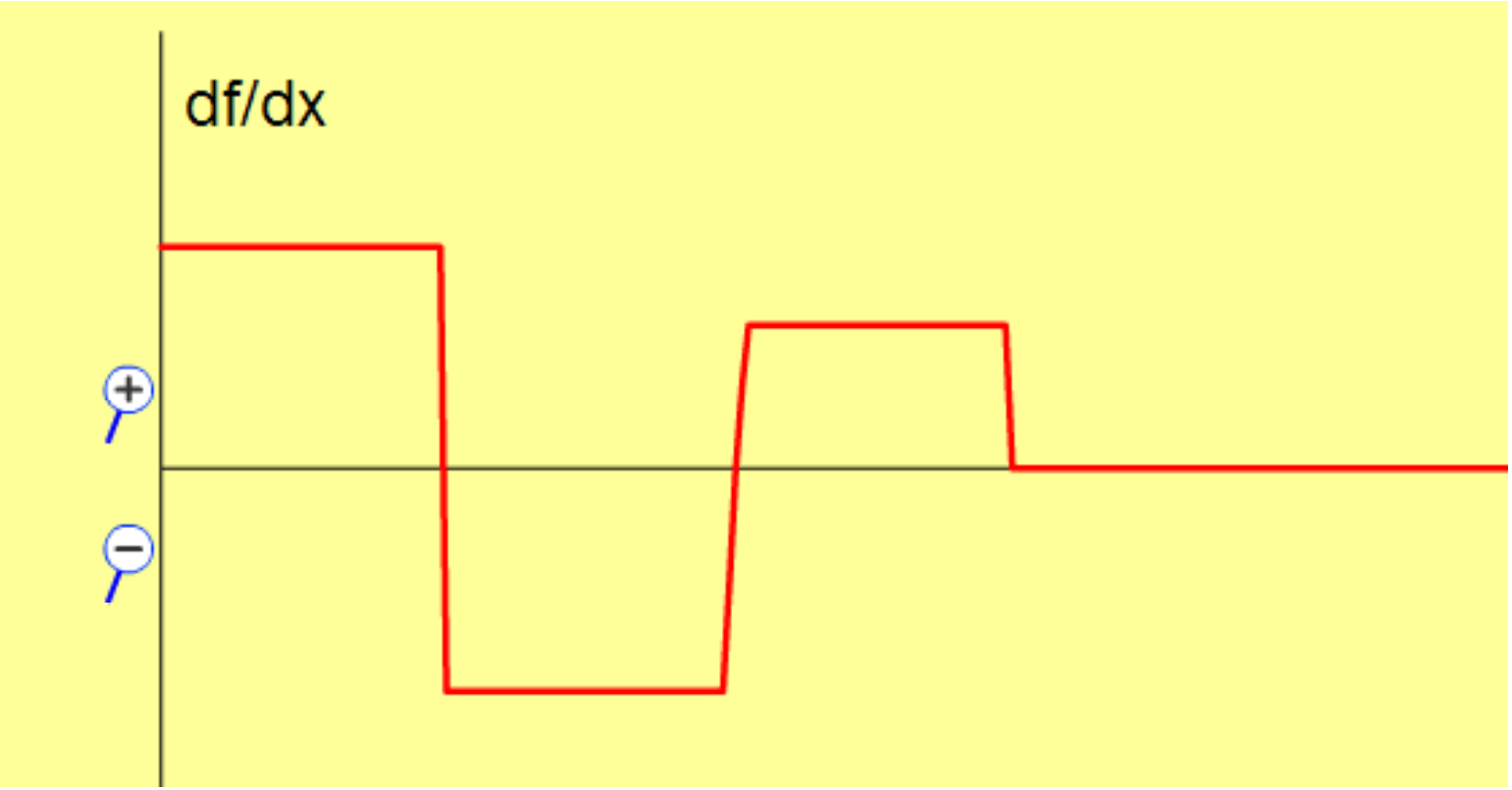
What does TILT do?



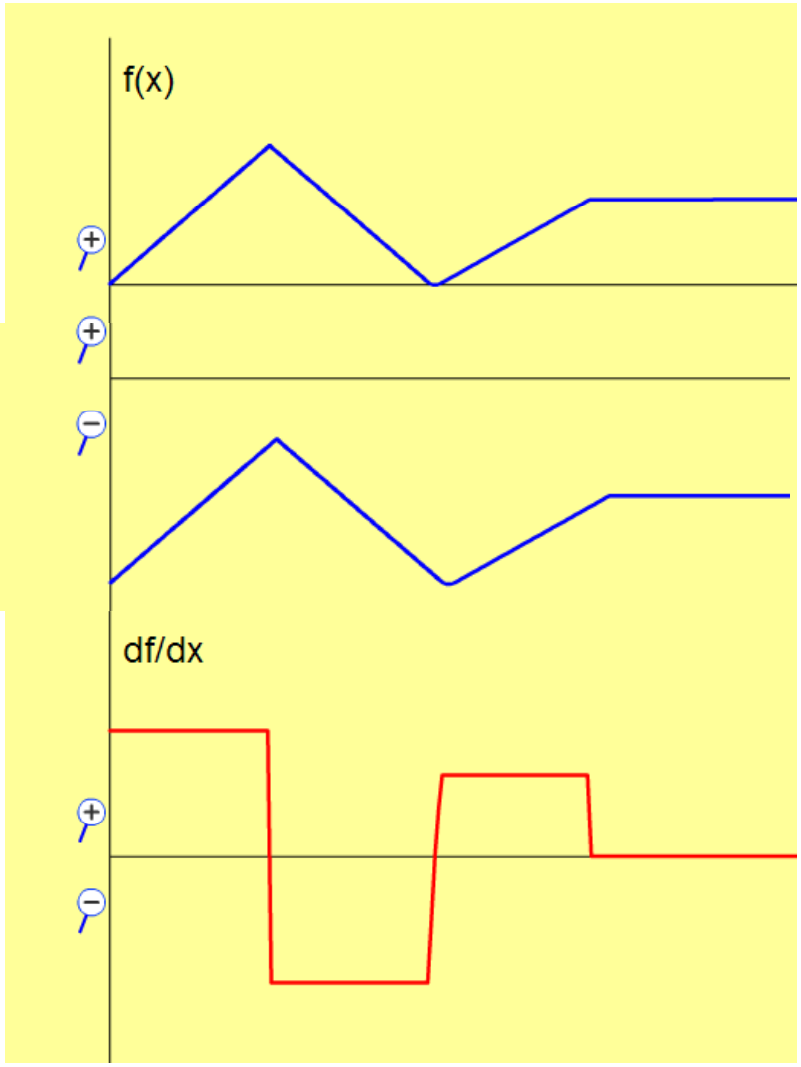


The derivative graph ZOOM was not changed; the height changed because of increased slope.

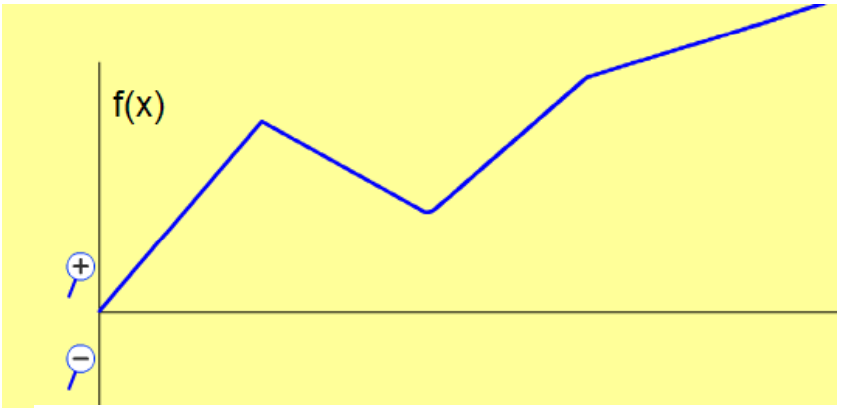
What does the function of this graph look like?



Possible answers: Shift doesn't matter again, and TILT changes values of derivative graph



OR



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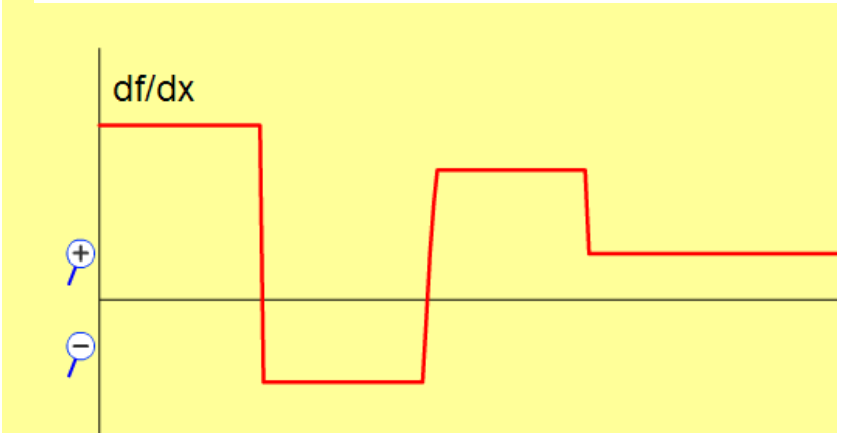


Clicker questions for post-lesson

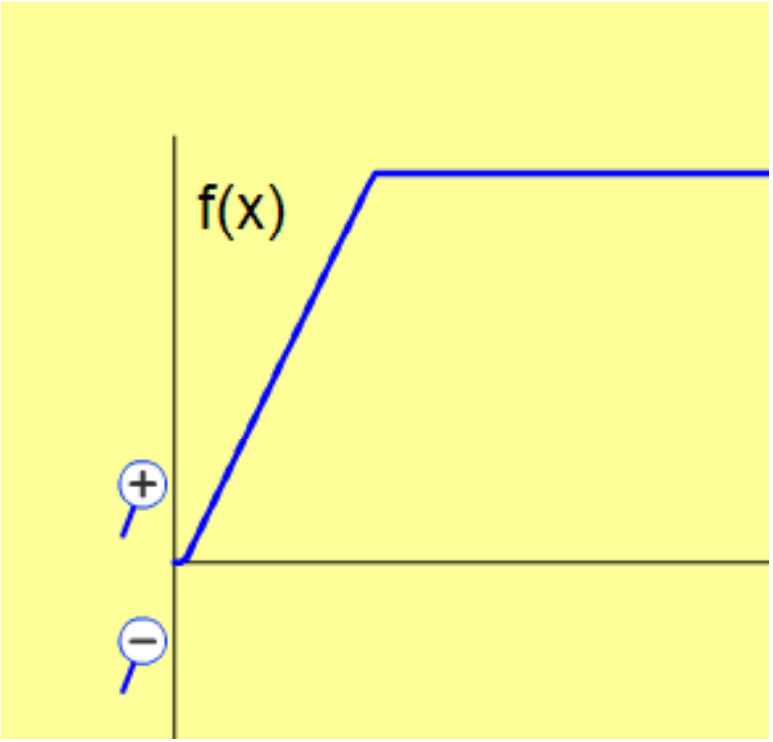
Open ***Calculus Grapher and Moving Man before starting clicker questions***

1. A car started from a stoplight, then sped up to a constant speed. This function graph describes his..

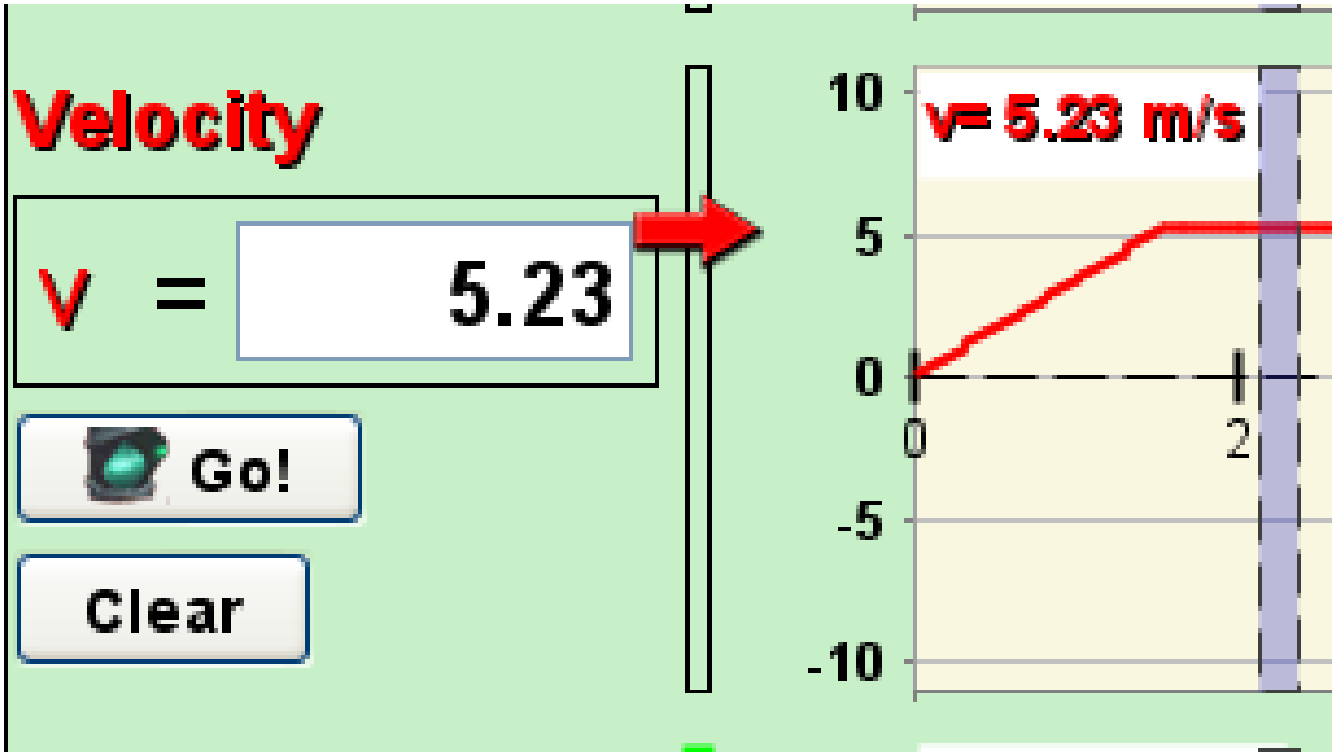
A. Position

B. Velocity

C. Acceleration



Use Moving man to show this: I set the acceleration at about 3 then paused the sim by the time the man got to the 4 spot, then I changed the acceleration to 0. If you have Moving man open with this type of scenario, you can use the grey bar to show that the speed was zero increasing and then constant.

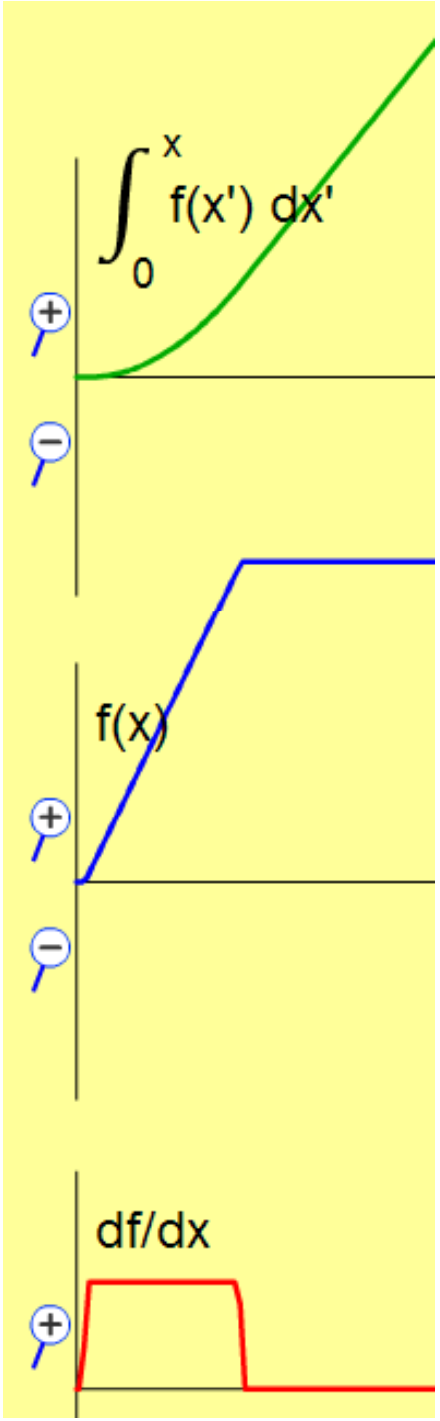


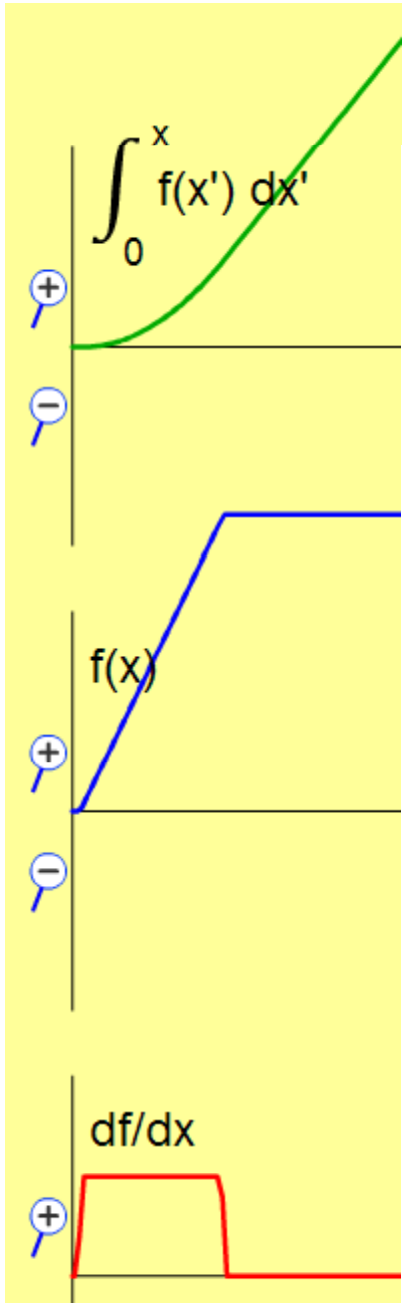
2. To find out how far he traveled, you would use

A. Integral

B. Function

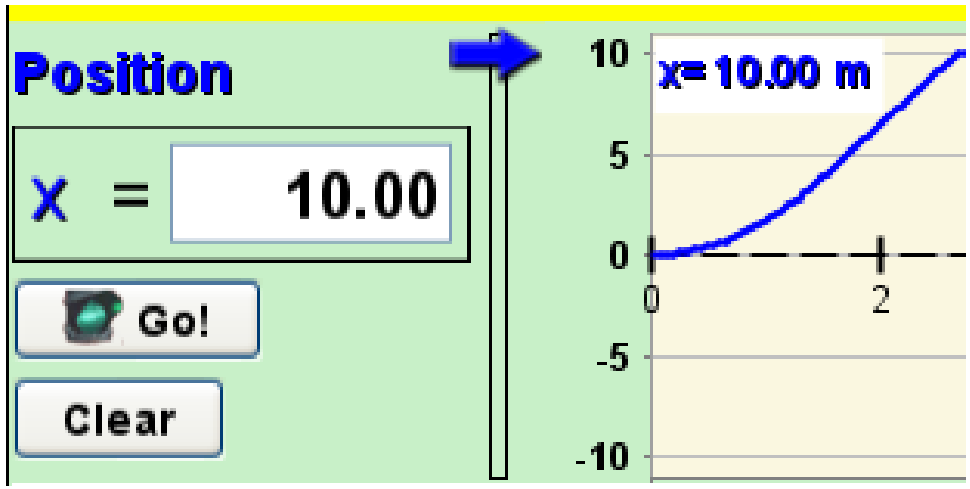
C. Derivative



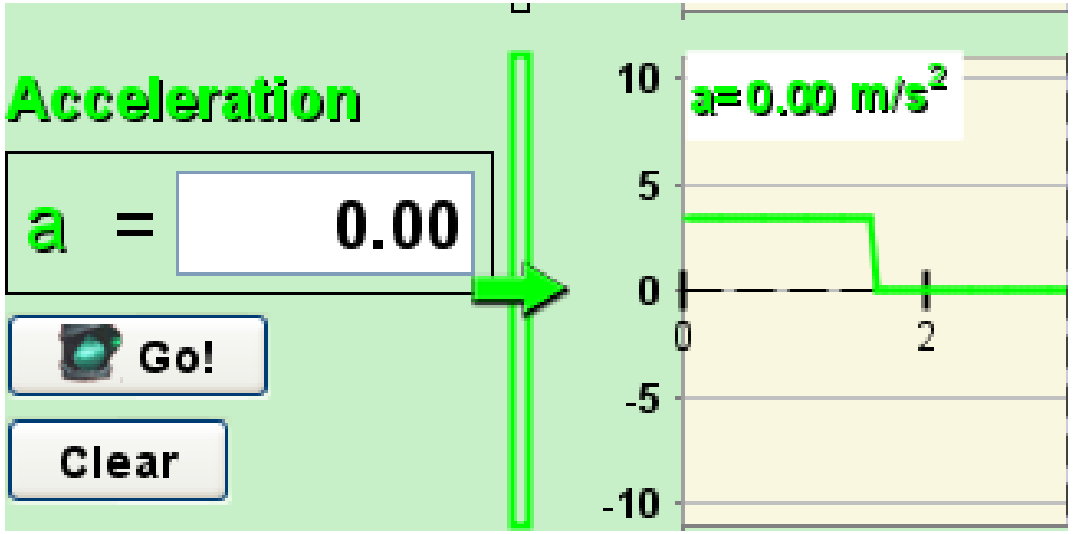


Use Moving Man **Replay** to show

Position is found by the integral curve

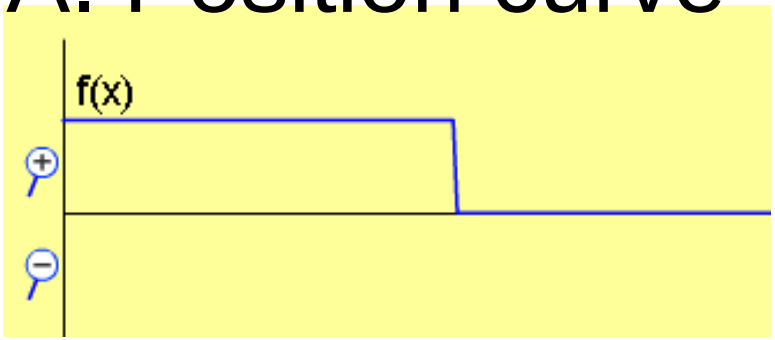


Derivative curve shows acceleration

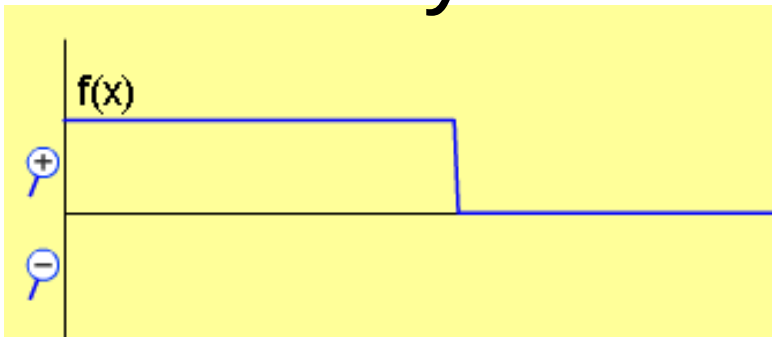


3. Your friend walks forward at a constant speed and then stops. Which graph matches her motion?

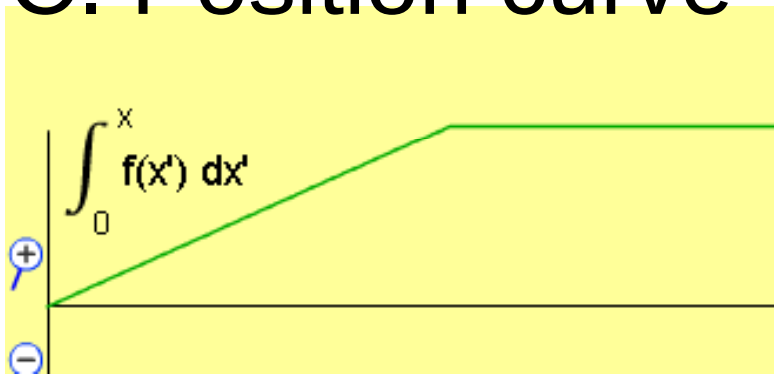
A. Position curve



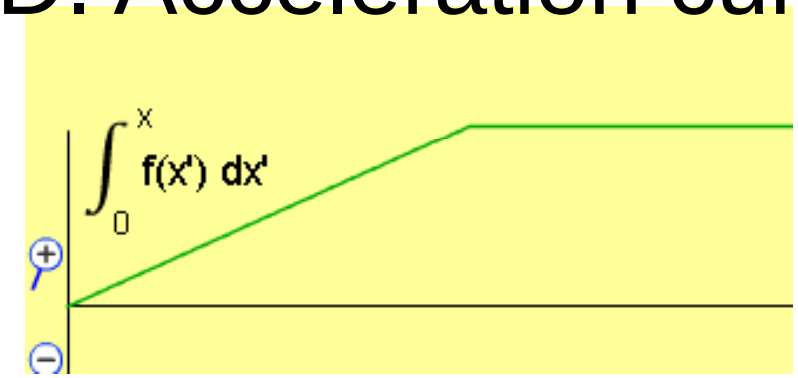
B. Velocity curve



C. Position curve

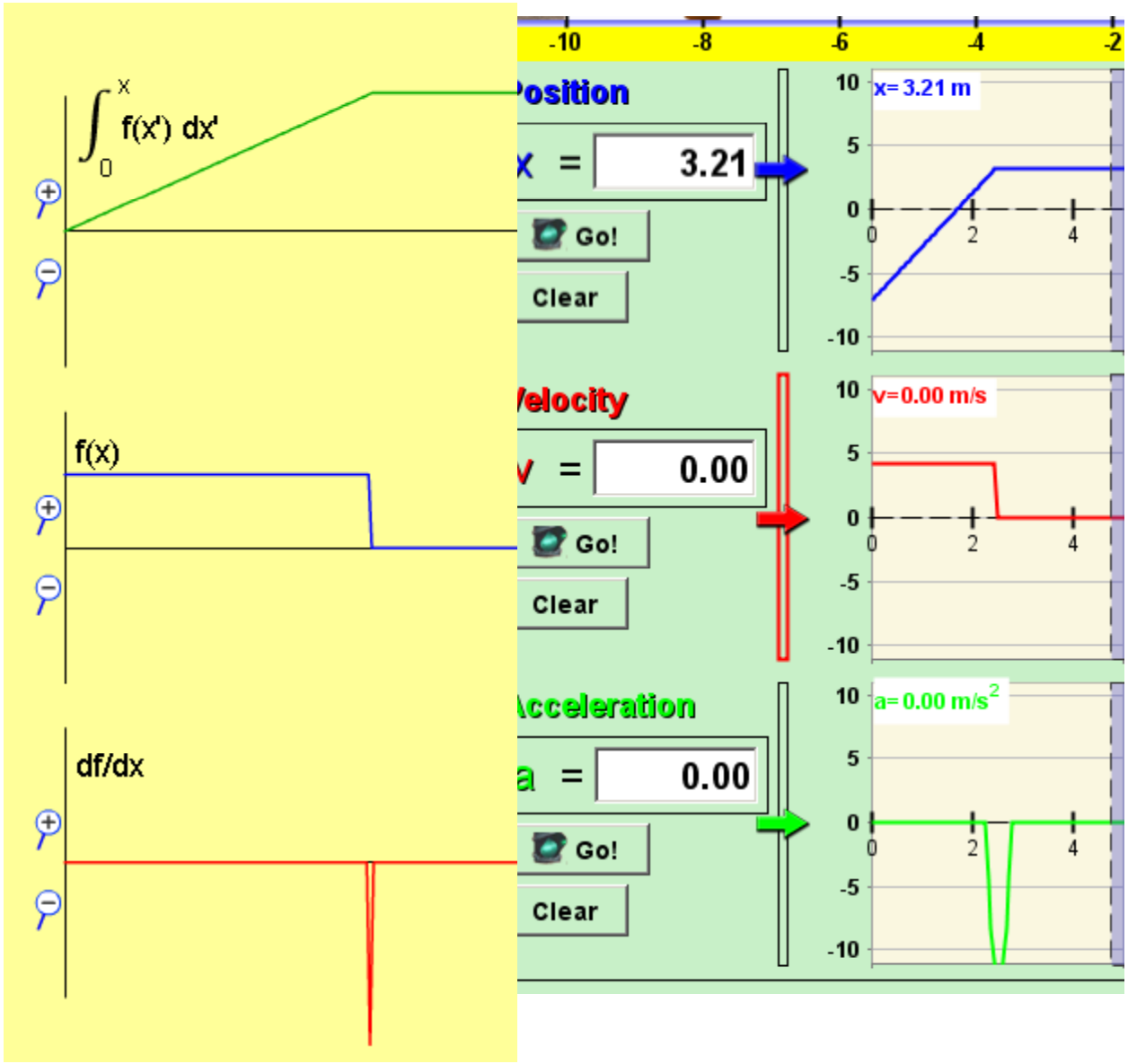


D. Acceleration curve



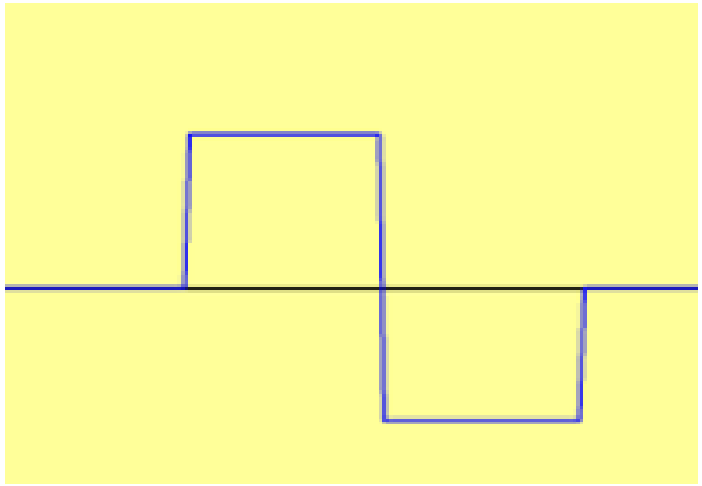
E. More than one of these

Use Moving man to show this: I set the Man at about -6 position, made the velocity about 4, then paused the sim by the time the man got to the 4 spot, then I changed the velocity to 0. If you have Moving man open with this type of scenario, you can use the grey bar to help.

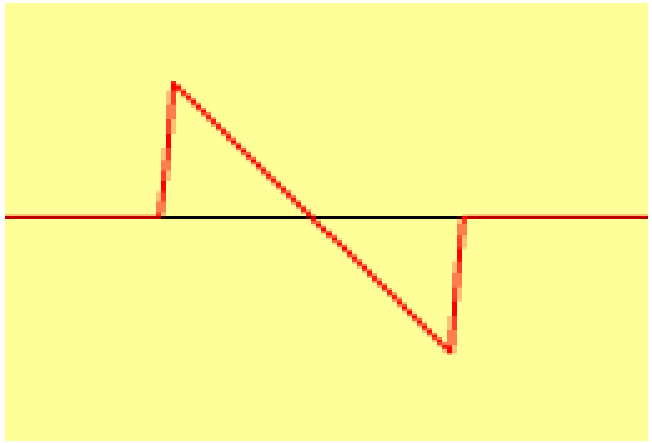


4. Which could be the derivative curve?

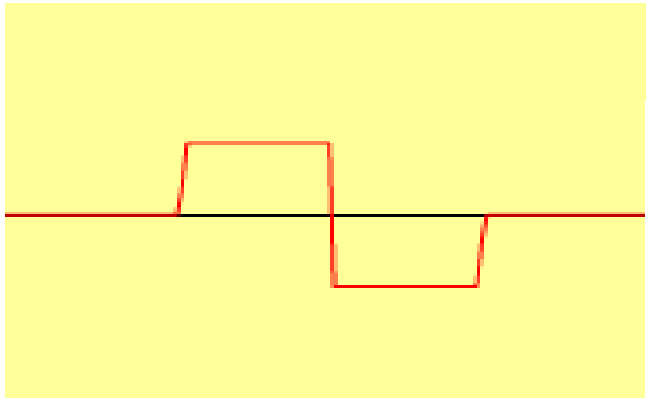
F(x)



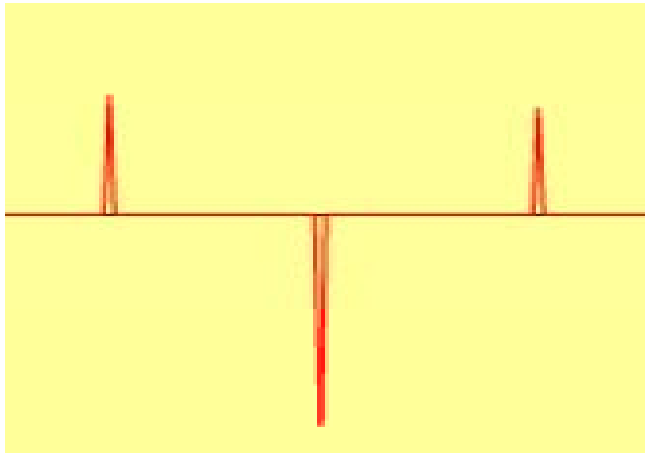
A



B



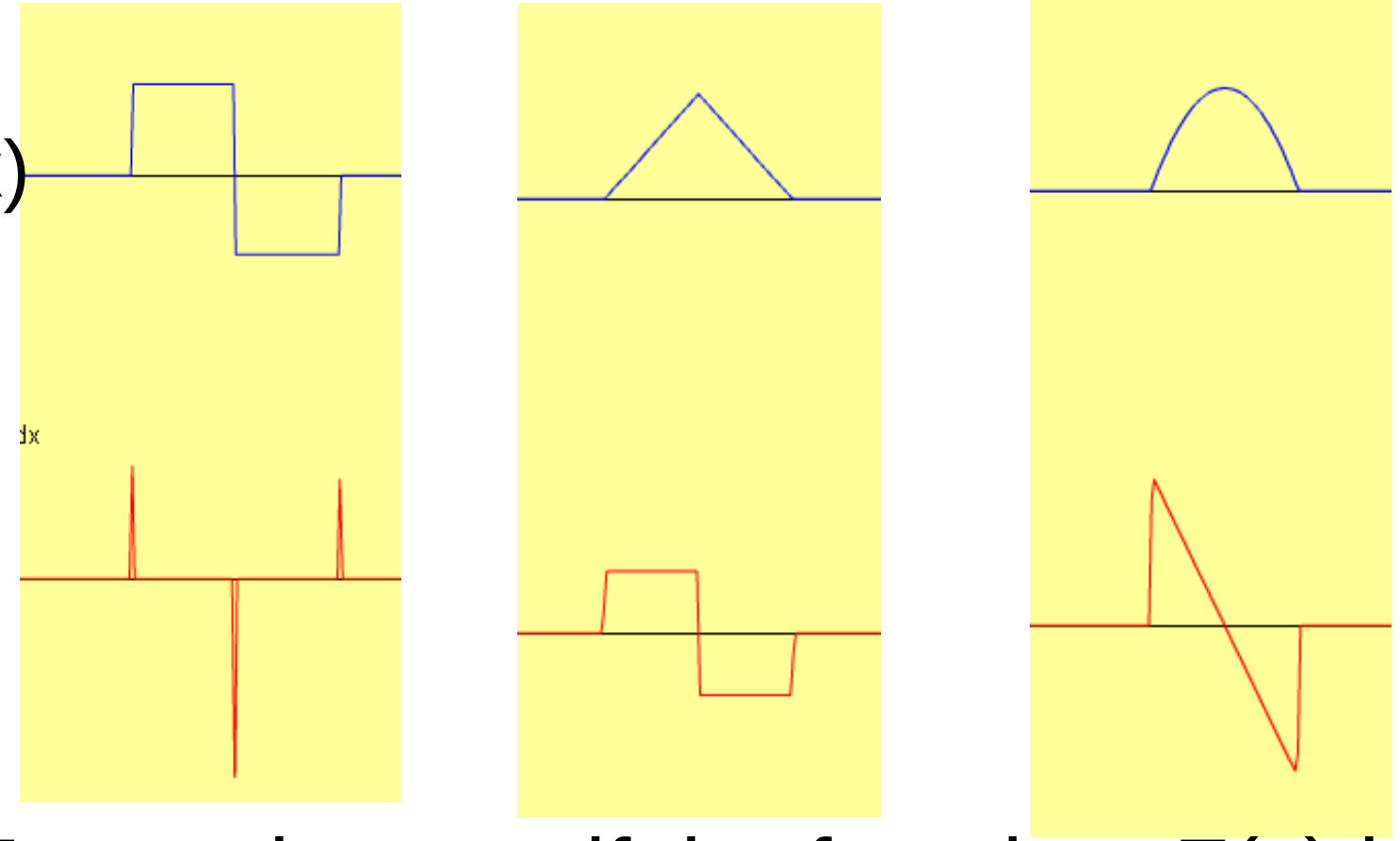
C



Pedestal Linear Parabola

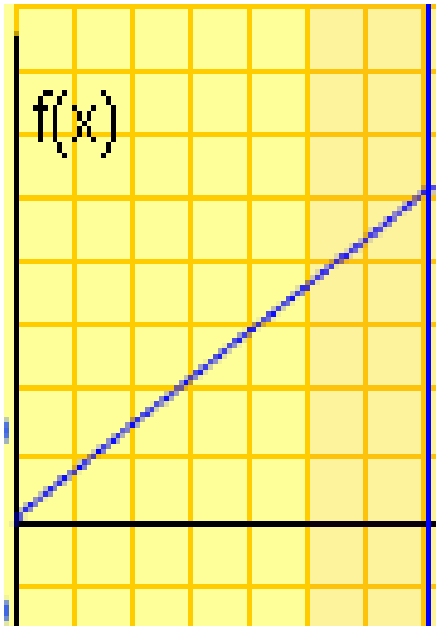
F(x)

$\frac{df}{dx}$

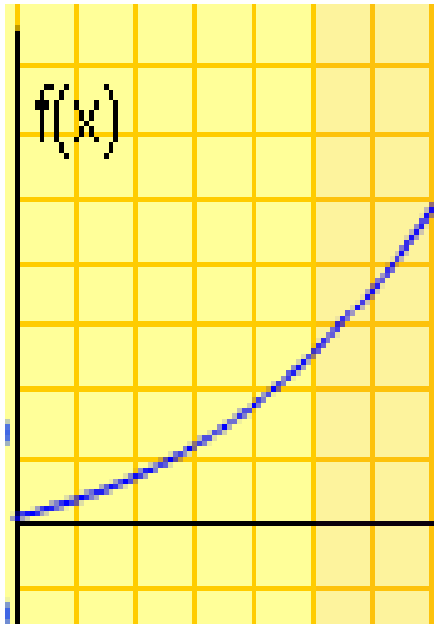


For each case, if the function, F(x) is velocity, what could a possible story for the motion of a person walking?

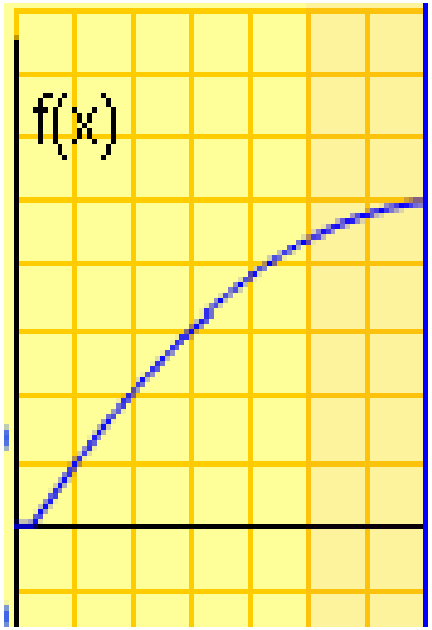
5. Three race cars have these velocity graphs. Which one probably wins?



A



B



C

D No way to tell

Max value

Use integral to tell that the parabolic one traveled

farthest