LECTURE 21

RELATED RATES

Oliver Knill, Harvard University

October 26 2020

PLAN

1. Poll

2. Related Rates

3. Ladder

4. Plane problem

5. Wine Glass

6. Baillong Elevator

7. Meeting Friends

POLL

$x(t)+y(t)=1$

$x' = 5$

what is

y'

A 5

B it depends

C -5

D -4

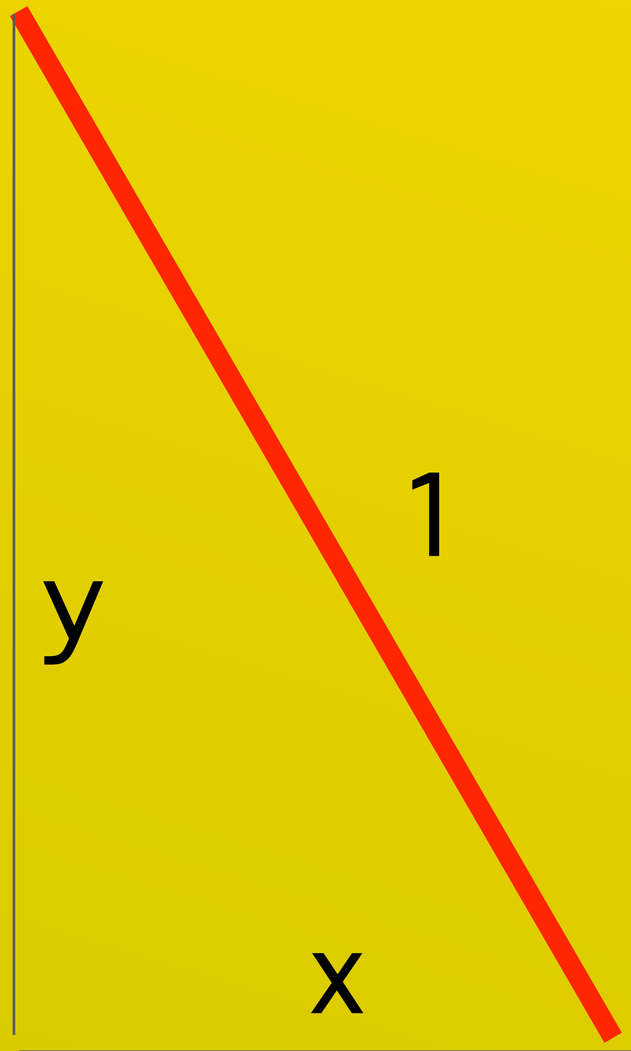
RELATED RATES

Related rates problems are given by a rule relating quantities.

$x+y=5$

$x(t),y(t)$ are quantities

LADDER PROBLEM

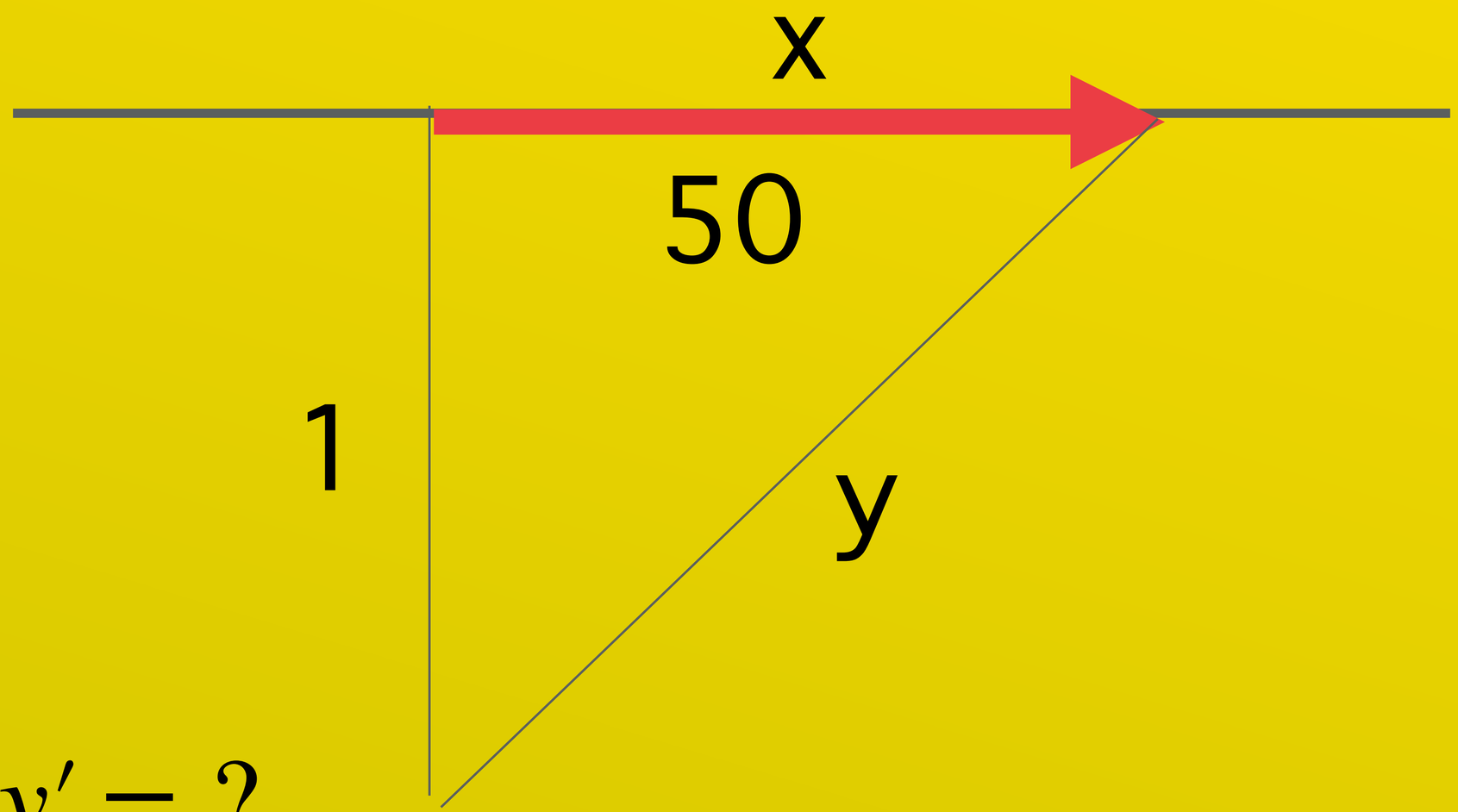


A ladder has length 5. It slips on the ground with constant speed x'=2. How fast does y' change if x=3

$$x^2 + y^2 = 5$$

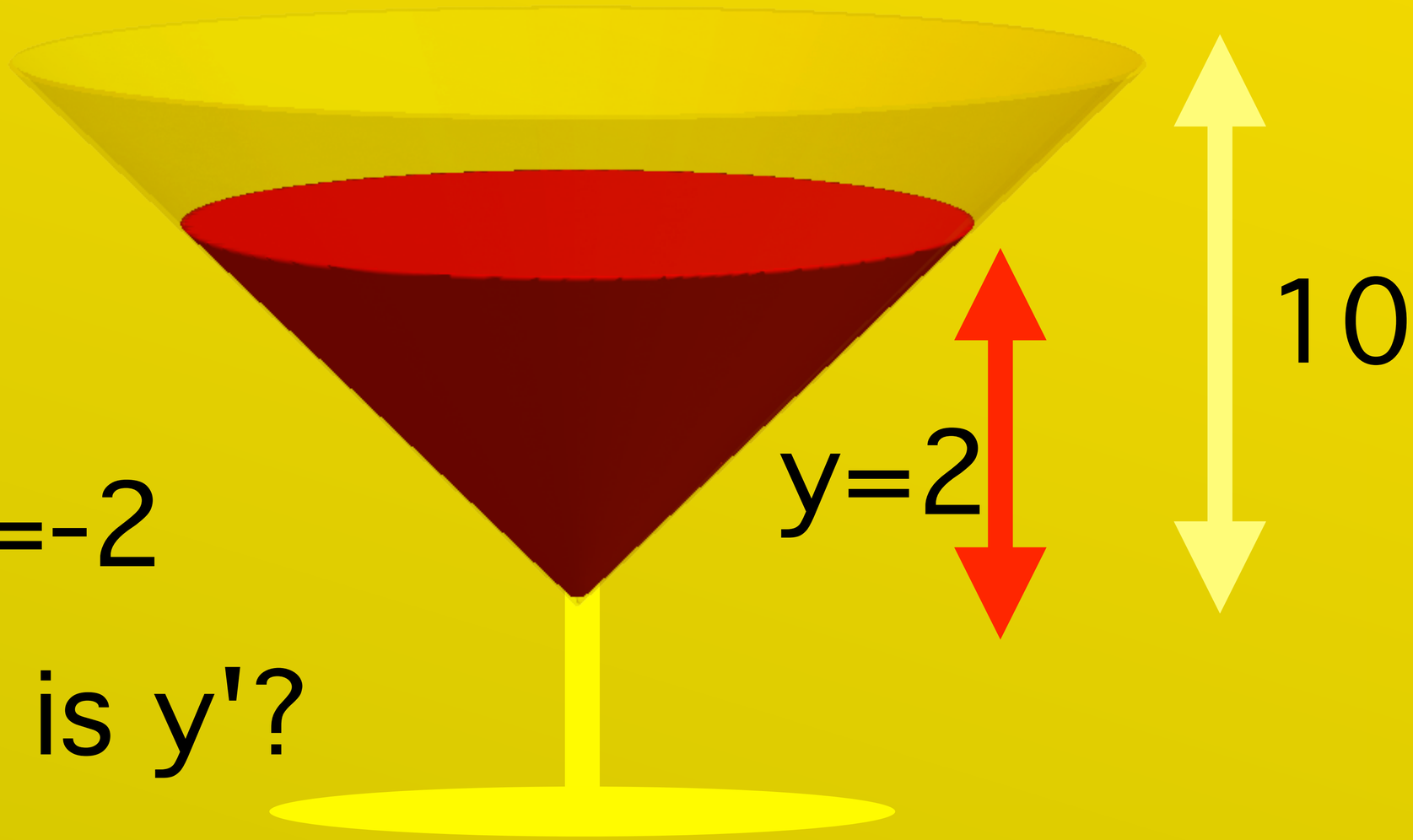
STAIRWAYS TO HEAVEN

PLANE PROBLEM



$x' = 500$ $y' = ?$

WINE GLASS

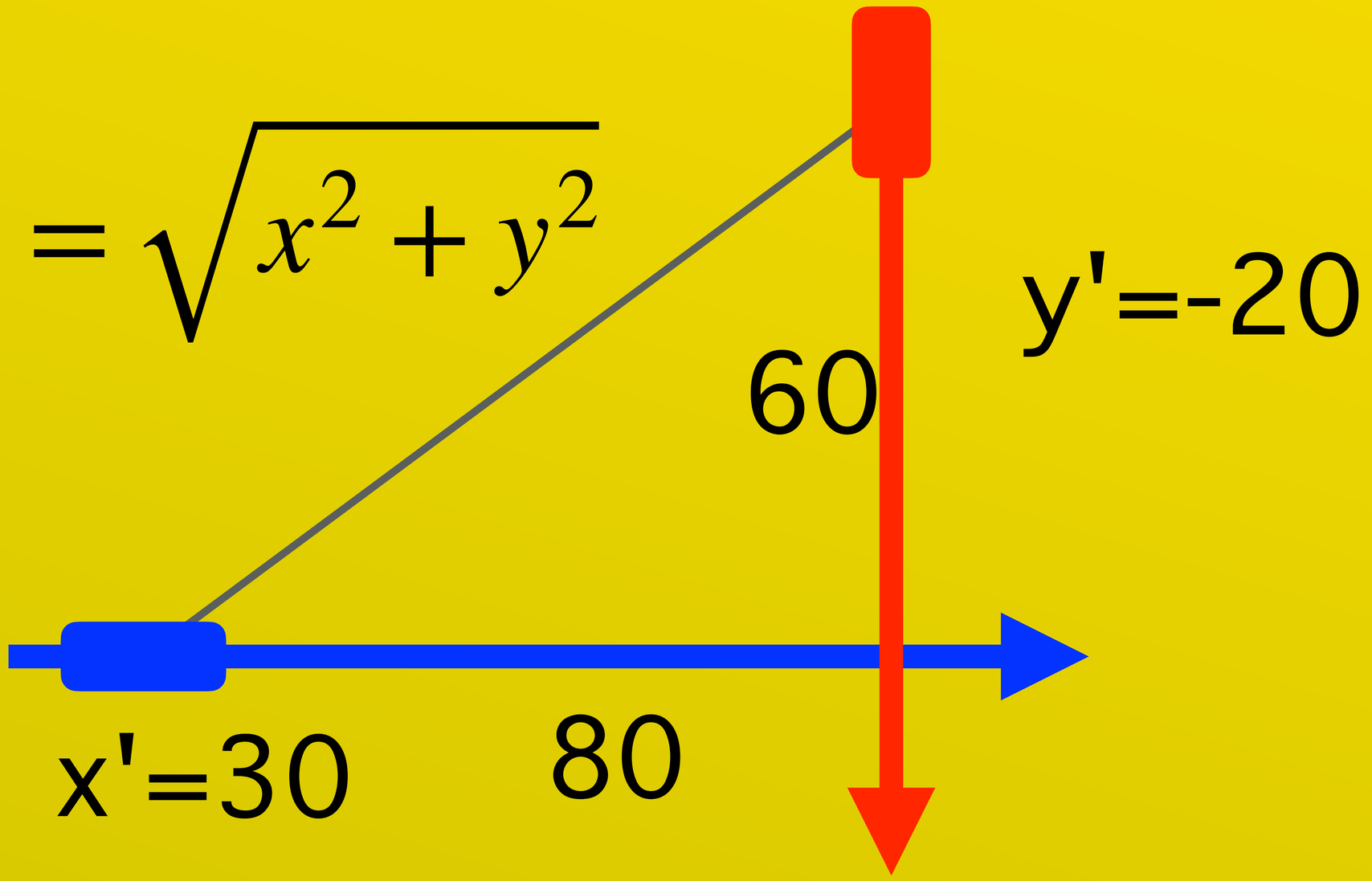


V'(y)=-2

What is y'?

CAR PROBLEM

$$d = \sqrt{x^2 + y^2}$$



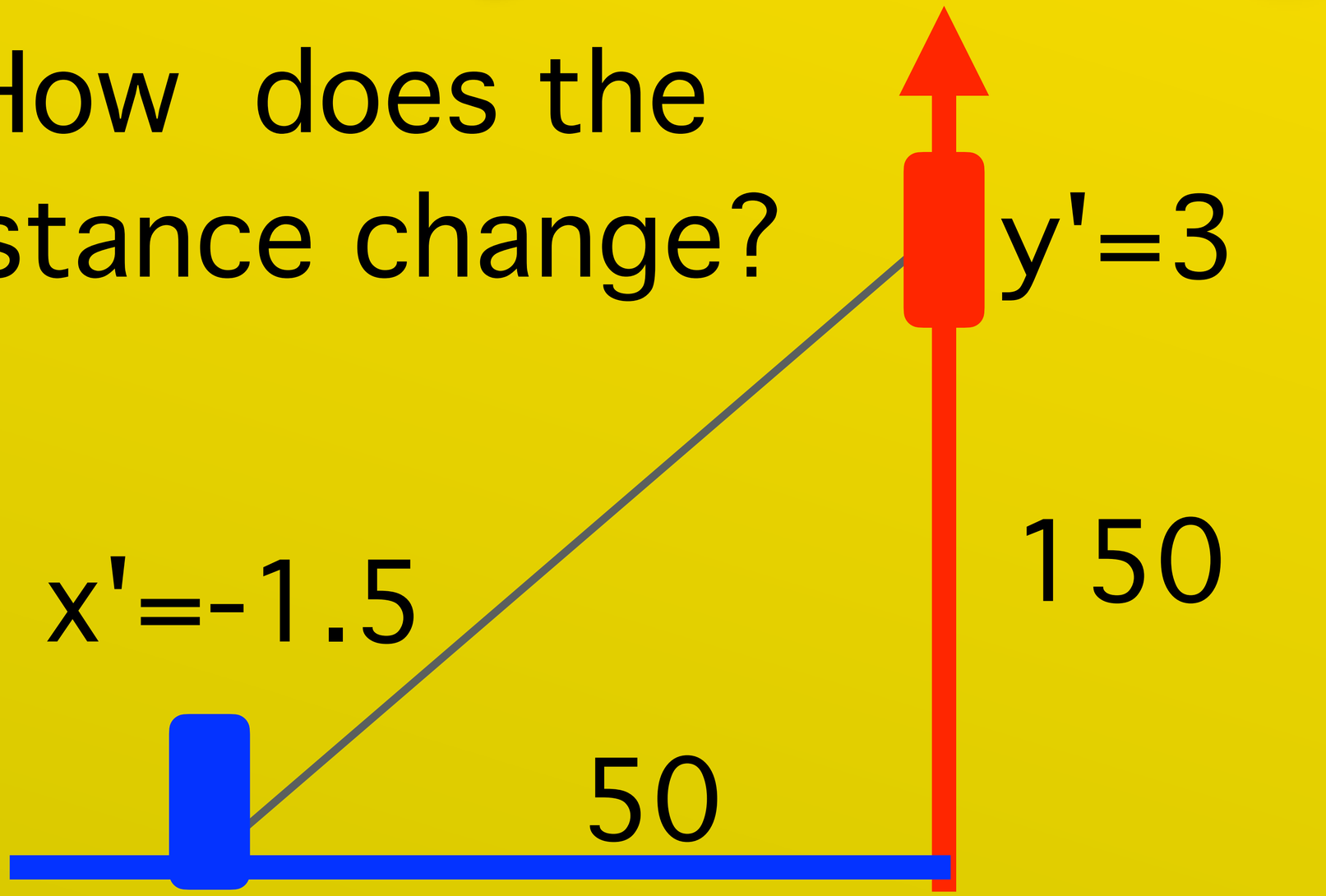
BAILONG

Youtube: wonder world

JAM

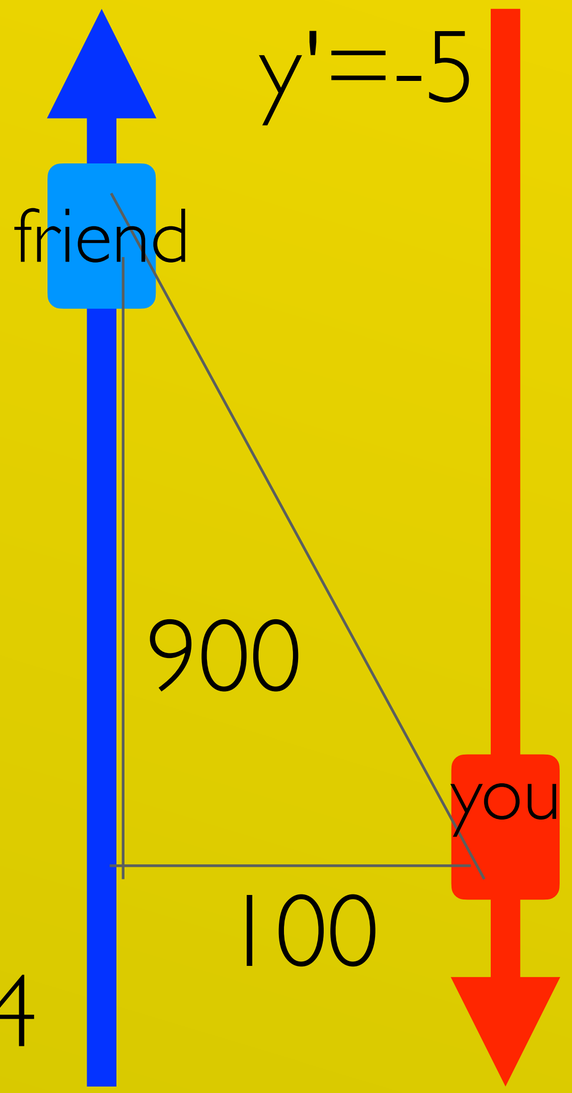
BAILONG ELEVATOR

How does the distance change?



JAM

HARVARD YARD RUN



At noon, you are dashing through Harvard Yard to get to class and notice a friend 100 feet west of you, also running to class. If you are running south at a constant rate of 450 ft/min (approximately 5 mph) and your friend is running north at a constant rate of 350 ft/min (approximately 4 mph), how fast is the distance between you and your friend changing at 12:02 pm?

THE END