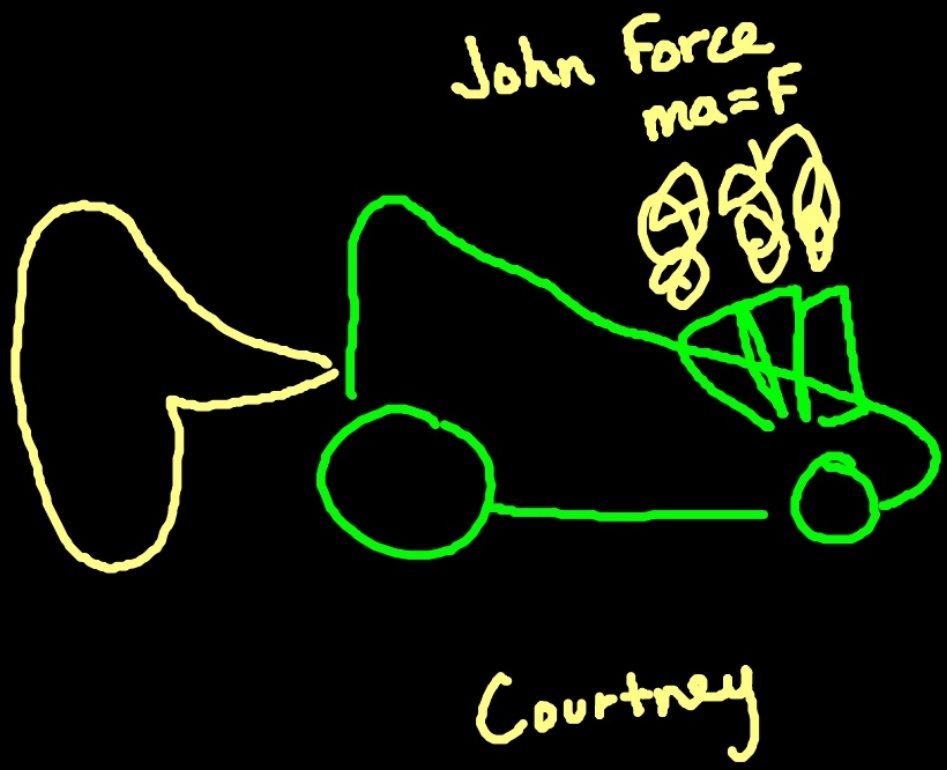
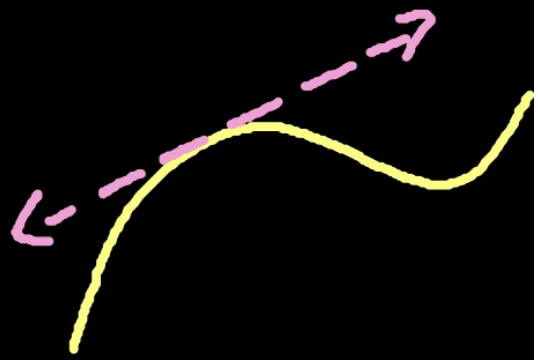
# What is the NHRA?

National Hot Rod Association



Today's learning objective:

By the end of class, I will be able to find the equations of tangent lines at any point on the original curve.



Today's language objective:

I will verbalize the following vocabulary with my peer group during class.

Derivative; Tangent; Gradient
Slope-intercept; Point-slope

# Let's build an NHRA function:

$f(x) = a(x-h)^2 + k$ (vertex form)

(0, 0)

(4, 320)

(8, 0)

$f(x) = a(x-4)^2 + 320$

$0 = a(0-4)^2 + 320$

$-320 \quad -320$

$-320 = a(-4)^2$

$\frac{-320}{16} = \frac{a \cdot 16}{16}$

$-20 = a$

$f(x) = -20(x-4)^2 + 320$

$f(x) = -20(x-4)^2 + 320$

$(x-4)(x-4)$

$f'(x) = 2(-20)(x-4)^1$

$(x^2 - 8x + 16)$

$f'(x) = -40x + 160$

$-20x^2 + 160x - 320$

$+320$

$f'(6) = -40(6) + 160$

$= -240 + 160$

$f'(6) = -80$

Point

$(6, 240)$

$f(6) = -20(6-4)^2 + 320$

$= -80 + 320$

$y = mx + b$

$(6, 240)$ $m = -80$

$x \quad y$

$240 = -80(6) + b$

$240 = -480 + b$

$720 = b$

$y = -80x + 720$

# Which tangent line should we analyze?

$f(x) = -20(x-4)^2 + 320$ $\quad x=2$

$f'(2) = -40(2) + 160$

$f'(2) = 80$

$240 = \underbrace{80(2)}_{160} + b$

$f(2) = 240$

$240 = 160 + b$

$-160 \quad -160$

$\boxed{80 = b}$ $\quad y = 80x + 80$

# What is the equation of the tangent line?

$\ln x = \frac{1}{x}$

$f(s) = \ln 6s$

$f'(s) = \frac{1}{6s} \cdot 6$

$= \frac{1}{s} = s^{-1}$

**velocity**

$ms^{-1} = m/s$

**acceleration**

$ms^{-2} = m/s^2$

$f''(s) = \frac{-1}{s^2}$

$y = 40x + b$

$300 = 40(3) + b$

$180 = b$

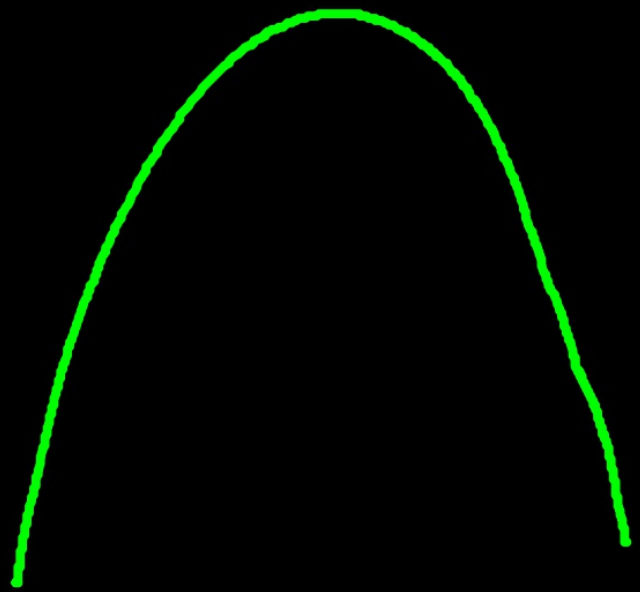
$y = 40x + 180$

$y = 320$

$x = 4$

max

# Remember Ms. Fowler's roller coaster?



What's the rate of change at the start of the roller coaster?