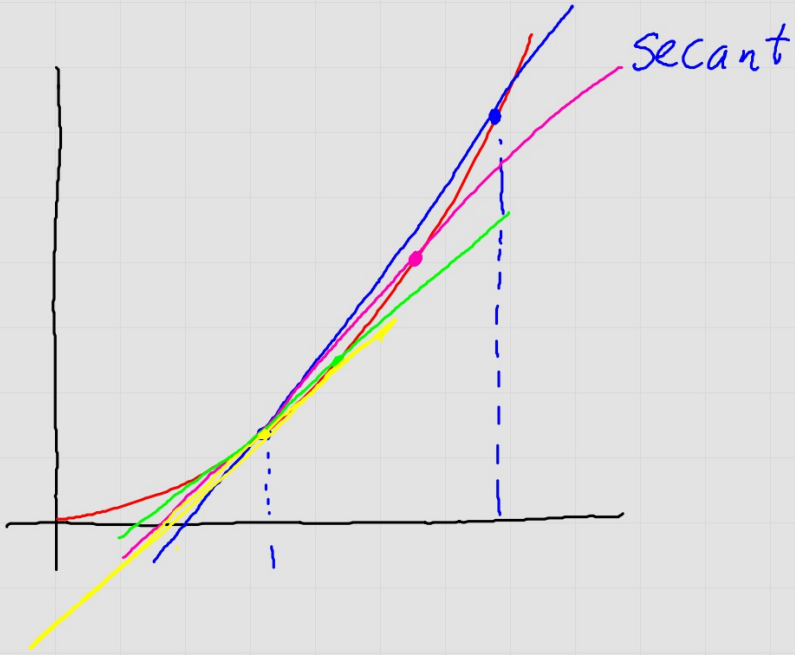
The Tangent and Velocity Problem



Find the vel at $t=1$ if $s(t)=t^2$

Write an eq. tan to $y=x^2$ at $x=1$.

$y(1)=1 \rightarrow (1,1)$

$s(1)=1$

Any pt on curve is given by (x, x^2)

$$m = \frac{x^2-1}{x-1}$$

x	m^v
1.500	2.500
1.100	2.100
1.010	2.010
1.001	2.001

x	m^v
.500	1.500
.900	1.900
.990	1.990
.999	1.999

$$\lim_{x \to 1} \frac{x^2-1}{x-1} = 2$$

$\therefore m_T = 2$

$\therefore \boxed{y-1 = 2(x-1)}$

$\therefore$ vel at $t=1$ is 2.

x	0	.1	.2	.3	.4
y	3.860	3.710	3.400	3.020	1.460

Write eq. of tan at $x = .2$

$$m = \frac{3.020 - 3.710}{.300 - .100} = -3.450$$

$$\therefore\ y - 3.400 = -3.450(x - .200)$$

$s(t) = -16t^2 + 630$ find vel at $t = 3$.

$s(3) = 486 \rightarrow (3, 486)$

Any pt on curve given by $(t, -16t^2 + 630)$

$$m = \frac{-16t^2 + 630 - 486}{t - 3}$$

t	m avg vel
3.500	
3.100	
3.010	
3.001	

t	m avg vel
2.500	
2.900	
2.990	
2.999	