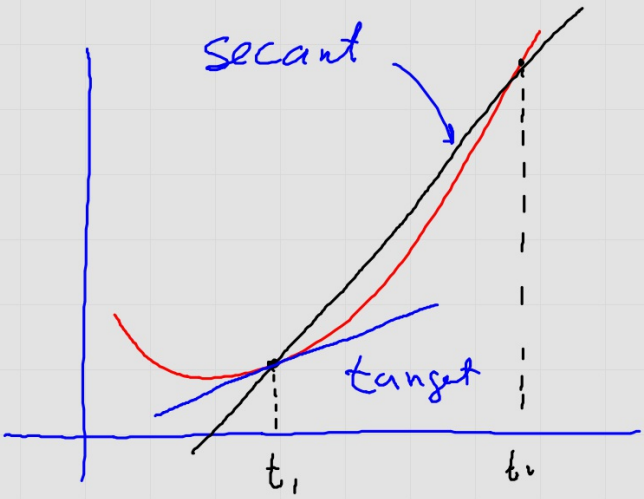
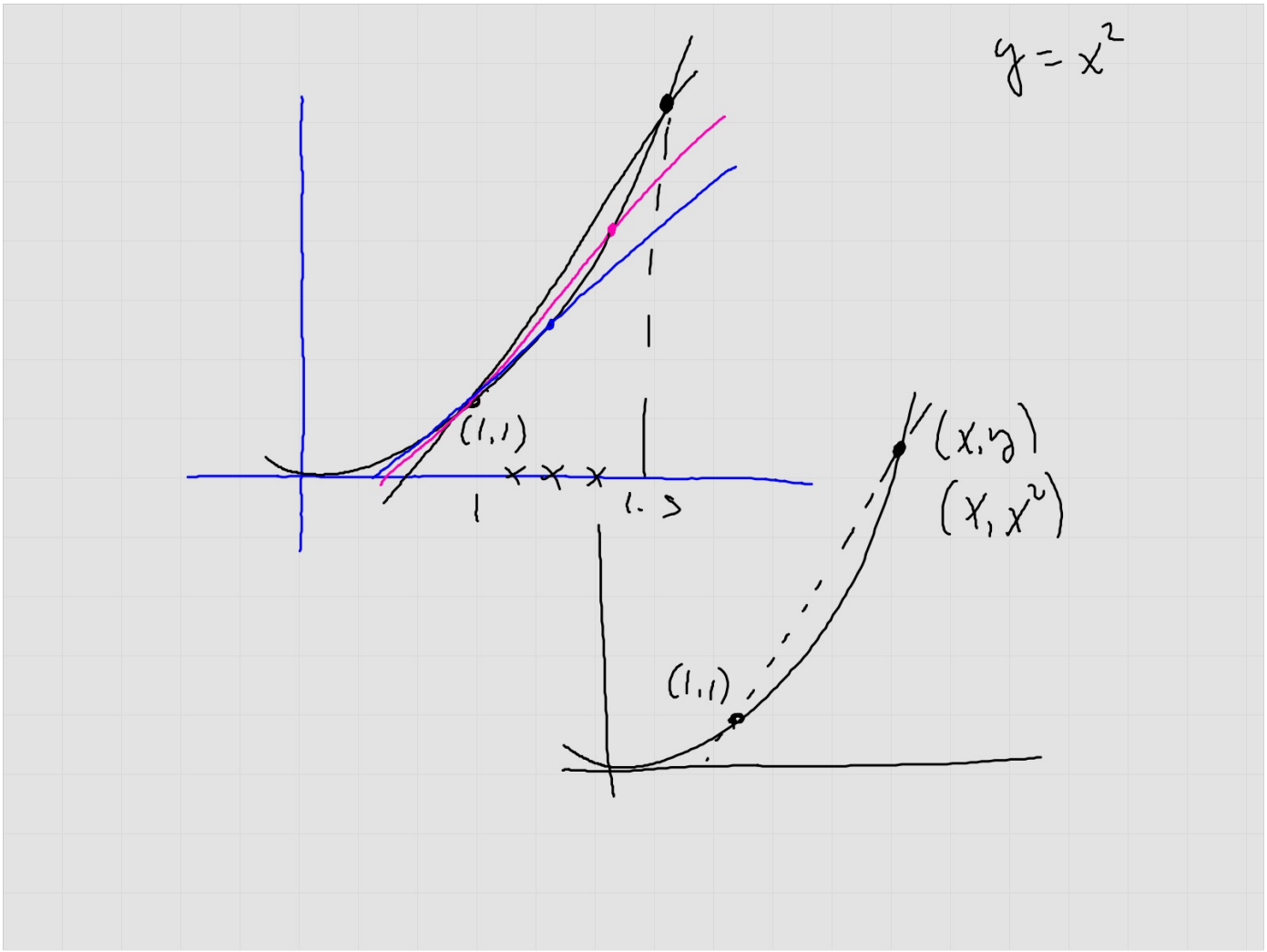
The Tangent and Velocity Problem




$y = x^2$
(1,1)
1
1.5
(x,y)
(x, x^2)
(1,1)

Write eq. of tangent to $y=x^2$ at $x=1$.

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

Any pt on $y=x^2$ is given by (x,x^2)

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

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

x	m
1.500	2.500
1.100	2.100
1.010	2.010
1.001	2.001

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

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

$m=2$

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

x	.1	.2	.3	.4	.5
y	.37	.39	.45	.61	.72

Write eq. of a tangent at $x = .3$

$$m = \frac{.61 - .39}{.4 - .2} = \frac{.220}{.2} = 1.100$$

$$\therefore y - .450 = 1.100(x - .3)$$

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

$s(3) = 486$

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

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

t	m
3.5	
3.100	
3.010	
3.001	

t	m
2.5	
2.900	
2.990	
2.999	