Slope of Tangent Line Using Secant Line and Concept of Limits
By: *Designing Team*

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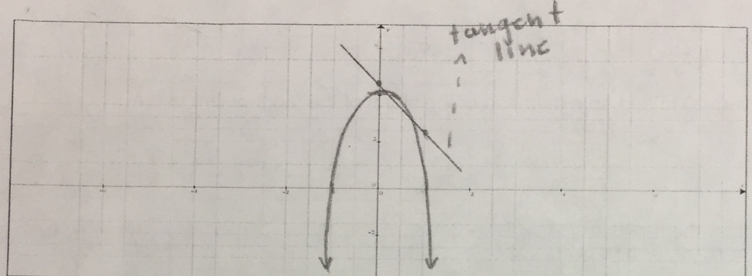
1. a) Sketch the graph of the function $f(x) = -x^2 + 4$



Find the slope of the secant line passing through the points P(1,3) and Q (given below)

b) Write the solpes in the following table:

$m = \frac{\Delta y}{\Delta x}$

$m = \frac{4-3}{0-1} =$

P(1,3)

$m = \frac{? - 3}{? - 1}$

$Q(x, -x^2+4)$	m
(0,4)	-1
(0.5, 3.75)	-1.5
(0.9, 3.19)	-1.9
(0.95, 3.0975)	-1.95
(0.99, 3.0199)	-1.99
(0.999, 3.001999)	-1.999

$Q(x, -x^2+4)$	m
(2, ~~4~~) 0	-3
(1.5, 1.75)	-2.5
(1.1, 2.79)	-2.1
(1.05, 2.8975)	-2.05
(1.01, 2.9799)	-2.01
(1.001, 2.997999)	-2.001

c) Which value is being approximated by the secant line when the point Q approaches the point P(1,3)? ≈ -2

same

d) Based on the prevoius information find the slope of the tangent line passing through (1, 3)
$= -2$

e) Find the equation of the tangent line at the point (1, 3)

$y = -2x + 5$

$y = mx + b$
$y - y_1 = m(x - x_1)$
$y - 3 = -2x + 2$

2. The point (2,1) lies on the curve $f(x) = \frac{1}{x-1}$.

a) If Q is the point $\left(x, \frac{1}{x-1}\right)$, find the slope of the secant line PQ (round to six decimals) for the following values of x:

$\frac{1}{(?)-1}$

i) 1.5 ii) 1.75 iii) 1.9 iv) 1.99 v) 1.999

$y = 2$ $y = 1.333333$ $y = 1.111111$ $y = 1.010101$ $y = 1.001001$

$m = -2$ $m = -1.333332$ $m = -1.111111$ $m = -1.0101$ $m = -1.001$

1.5
1.75
1.9
1.99
1.999

b) Use the results of part (a) to find an estimation of the slope of the tangent line to the curve at (2,1)

$\cong -1$

3. The point (6,2) lies on the curve $f(x) = \sqrt{x-2}$.
x y

a) If Q is the point $\left(x, \sqrt{x-2}\right)$, find the slope of the secant line PQ (round to six decimals) for the following values of x:

$m = 0.258344$ $= 0.25159$ $= 0.2502$ $= 0.249$ $= 0.2498$ $= 0.24845$

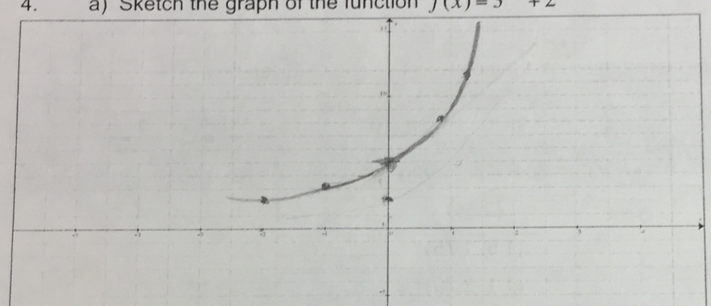
i) 5.5 ii) 5.9 iii) 5.99 iv) 6.001 v) 6.01 vi) $6.\cancel{0}1$

$m = \frac{y_2 - 2}{x_2 - 6}$ $y = 1.870828$ $y = 1.974841$ $y = 1.997498$ $y = 2.000249$ $y = 2.002498$ $y = 2.024845$

b) Use the results of part (a) to find an estimation of the slope of the tangent line to the curve at (6,2)

$\cong 0.25$

4. a) Sketch the graph of the function $f(x) = 3^{x+1} + 2$



b) Find the slope of the secant line passing through the points P(0,5) and Q (given below)

a) Write the solpes in the following table:

$m = \frac{y_2 - 5}{x_2 - 0}$

$Q(x, 3^{x+1}+2)$	m
(0,5)	∅
(0.5, 7.196)	4.392
(0.25,5.948)	3.792
(0.15, 5.537)	3.58
(0.1, 5.348)	3.48
(0.01, 5.033)	3.3

$Q(x, 3^{x+1}+2)$	m
(-0.5,3.732)	2.536
(-0.25, 4.280)	2.88
(-0.15, 4.544)	3.04
(-0.1, 4.688)	3.12
(-0.01, 4.997)	0.3

b) Which value is being approximated by the secant lines when the point Q approaches the point P(0,5)?

$\cong 3.3$

c) Based on the prevoius information find the slope of the tangent line passing through (0,5)

m_{tan} $\cong 3.3$

d) Find the equation of the tangent line at the point (0, 5)

$y - 5 = 3(\cancel{0}x - 0)$

$y = 3.3x + 5$

$y = mx + b$

$y - y_1 = m(x - x_1)$