Name: ______________________________ ________ / 25

There are 25 points possible on this quiz. No aids (book, calculator, etc.) are permitted. **Show all work for full credit.**

1. [11 points] Let $P(0,6)$ be a point on the graph of $f(x) = \frac{10}{x+1} + x - 4$.

a. Find the slope of the secant line passing through P and the point $Q(1, f(1))$.

$f(1) = \frac{10}{2} + 1 - 4 = 5 - 3 = 2$; $m_{sec} = \frac{\Delta y}{\Delta x} = \frac{6-2}{0-1} = -4$

b. Find the slope of the secant line passing through P and the point $Q(4, f(4))$.

$f(4) = \frac{10}{5} + 4 - 4 = 2$; $m_{sec} = \frac{\Delta y}{\Delta x} = \frac{6-2}{0-4} = -1$

c. The table below lists the slope of the secant line passing through the point P and the point $Q(x, f(x))$ for several values of x.

as $x \to 0$ $\longrightarrow$ 0 $\longleftarrow$

x	-0.1	-0.01	-0.001	0.001	0.01	0.1
f(x)	7.011111	6.091010	6.00901	5.99910	5.9910	5.91099
m_{sec}	-10.111111	-9.101010	-9.00100	-8.99900	-8.90099	-8.090909

$m_{sec} \to -9$ $\longrightarrow$ -9 $\longleftarrow$

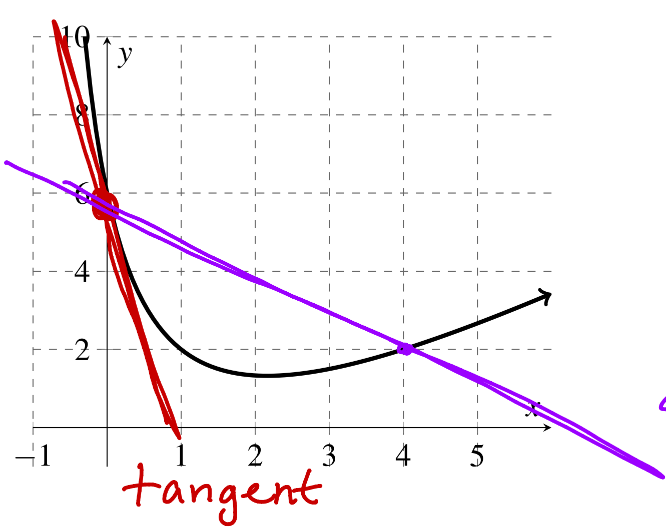
Use the information in the table to estimate the slope of the tangent line to $f(x)$ at the point $P(0,6)$.

as $x \to 0$, $m_{sec} \to -9$; estimate $\underline{m_{tan} = -9}$.

d. Use the slope from part (c) above to write an equation of the tangent line at point $P(0,6)$.

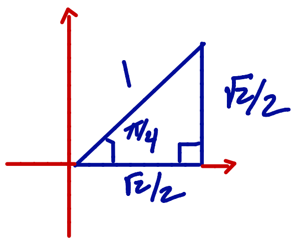
$m = -9$
point $(0,6)$ line: $y - 6 = -9(x - 0)$ or $y = 6 - 9x$

e. Below is a sketch of the graph of $f(x) = \frac{8x}{x+1}$. Sketch the **tangent** line to the graph at the point $P(0,6)$ and sketch the **secant** line between $P(0,6)$ and $Q(4, f(4))$.

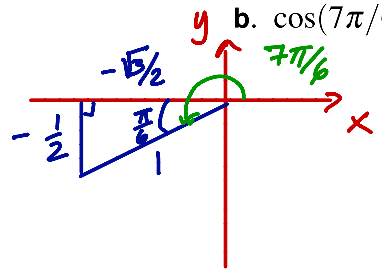


2. [8 points] Evaluate the expressions below. Assume all angles are measured in radians.

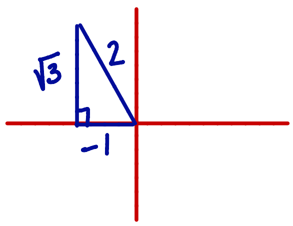
a. $\sin(\pi/4) =$ $\sqrt{2}/2$



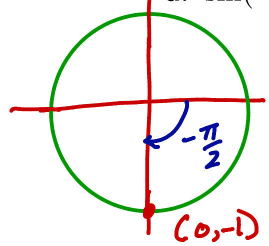
b. $\cos(7\pi/6) =$ $-\sqrt{3}/2$



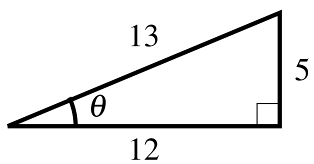
c. $\tan(2\pi/3) =$ $\frac{\sqrt{3}}{-1} = -\sqrt{3}$



d. $\sin(-\pi/2) =$ -1



3. [2 points] Use the right triangle below, with side lengths 12, 5 and 13, to evaluate the expressions.



a. $\cos(\theta) =$ $\frac{adj}{hyp} = \frac{12}{13}$

b. $\csc(\theta) =$ $\frac{hyp}{opp} = \frac{13}{5}$

4. [4 points] An athlete is running along a straight path. The position of the athlete is given by $d(t) = \frac{1}{2}t^2 + t$, where t is time measured in seconds and d is distance measured in meters. Find the average velocity of the athlete between $t = 2$ and $t = 4$. Include units with your answer.

average velocity $= \frac{\Delta d}{\Delta t} = \frac{12-4}{4-2} = \frac{8}{2} = 4$ m/s

$d(4) = \frac{1}{2} \cdot 16 + 4 = 8 + 4 = 12$

$d(2) = \frac{1}{2} \cdot 4 + 2 = 2 + 2 = 4$