Name: Key ______ / 25

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

1. **[10 points]** Let $P(0,1)$ be a point on the graph of $f(x)=\sqrt{x+1}$.

   a. Find the **slope of the secant line** passing through P and the point $Q(3, f(3))$. $f(3)=2$

   $$m = \frac{2-1}{3-0} = \frac{1}{3}$$

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

x	-1	-0.1	-0.01	0.01	0.1	1
f(x)	0	0.9487	0.9950	1.0050	1.0488	1.4142
m_{sec}	1.0	0.5132	0.5013	0.4988	0.4881	0.4142

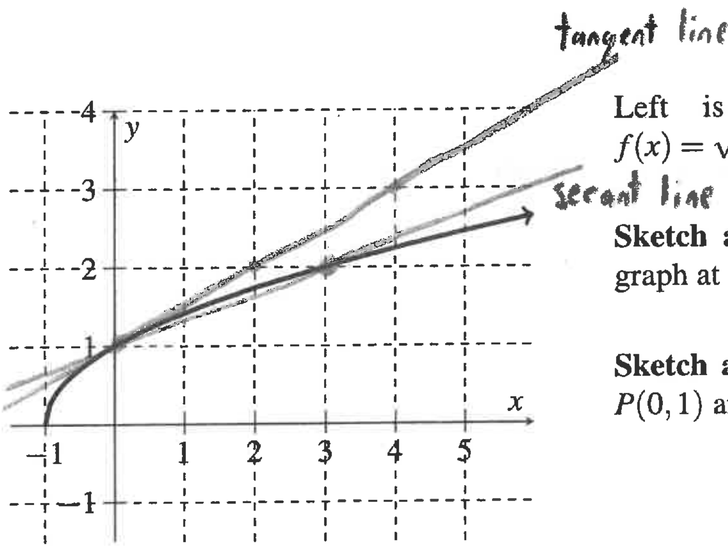
   Use the information in the table to estimate the **slope of the tangent line** to $f(x)$ at the point $P(0,1)$.

   $$m = \frac{1}{2}$$

   c. Use the slope from part (b) above to write an **equation of the tangent line** at point $P(0,1)$.

   $$y-1 = \frac{1}{2}(x-0) \Rightarrow y = \frac{1}{2}x+1$$

   d.



Left is a sketch of the graph of $f(x)=\sqrt{x+1}$.

Sketch and label the tangent line to the graph at the point $P(0,1)$.

Sketch and label the secant line between $P(0,1)$ and $Q(3, f(3))$.

2. [5 points] A professional cyclist is riding along a straight road. For the first minute, the distance in feet that the cyclist has traveled after t seconds is given by the function $p(t) = \frac{1}{2}t^2 + t$. Find the **average velocity** of the cyclist between $t = 2$ and $t = 4$ seconds. Include units with your answer.

$$\text{average velocity} = m_{sec} = \frac{p(4) - p(2)}{4-2} = \frac{12-4}{2} = \frac{8}{2} = 4\ \frac{\text{ft}}{\text{sec}}$$

3. [8 points] Evaluate the expressions below. Assume all angles are measured in radians.

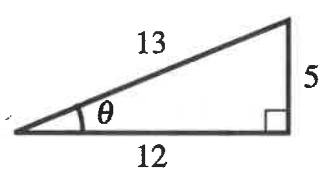
a. $\cos(\pi/4) = \frac{\sqrt{2}}{2}$

b. $\sin(7\pi/6) = -\frac{1}{2}$

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

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

4. [2 points] Use the right triangle below, with side lengths 12, 5, and 13, to evaluate the expressions.



a. $\cot(\theta) = \frac{12}{5}$

b. $\sec(\theta) = \frac{13}{12}$