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 $P(2,2)$ be a point on the graph of $f(x) = \dfrac{6-x}{x}$.

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

b. 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.

x	1.9	1.99	1.999	2.001	2.01	2.1
f(x)	2.157895	2.015075	2.001501	1.998501	1.985075	1.857143
m_{sec}	-1.57895	-1.50754	-1.50075	-1.49925	-1.49254	-1.42857

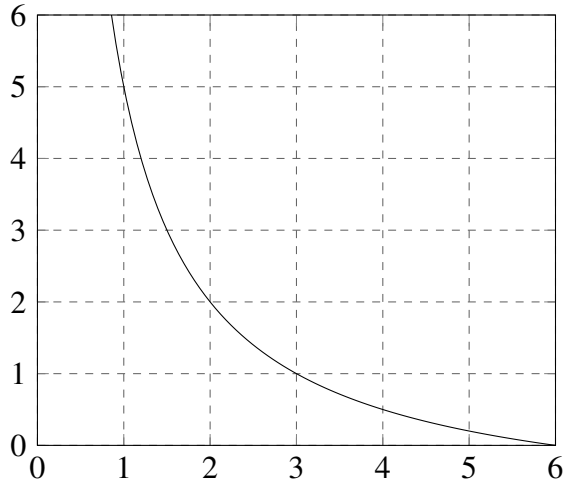
Use the information in the table to estimate the slope of the tangent line to $f(x)$ at the point $P(2,2)$.

c. Use the slope from part (c) above to write an equation of the tangent line at point $P(2,2)$.

d. Below is a sketch of the graph of $f(x) = \frac{6-x}{x}$.

(a) Sketch the **tangent line** to the graph at the point $P(2,2)$.
Label it with the word TANGENT.

(b) Sketch the **secant line** passing through $P(2,2)$ and $Q(1, f(1))$.
Label it with the word SECANT.



2. [8 points] The height, h, of an object is given by the expression $h(t) = 10 - \sqrt{t}$ where h is measured in meters and t is measured in seconds.

a. Compute the **average velocity** of the object over the time intervals. Include units with your answers.

(i) $[0, 1]$

(ii) $[1, 4]$

b. **Using the calculations you did in part (a) above,** estimate the **instantaneous velocity** of the object when $t = 1$. Include units with your answer.

c. **What do your calculations in part (b) above** indicate about whether the object appears to be rising (gaining height) or dropping (losing height)?

3. [6 points] An object is attached to a spring suspended from above. The height of the object above the ground is given by $h(t) = 4\cos(\pi t) + 6$ where h is in inches and t is in seconds.

a. Calculate the length of the spring at $t = \frac{1}{3}$ seconds and $t = \frac{2}{3}$ seconds. Include units in your final answers.

$h\left(\frac{1}{3}\right) =$

$h\left(\frac{2}{3}\right) =$

b. Find the **average velocity** of the object over the time interval $\left[\frac{1}{3}, \frac{2}{3}\right]$. Show your work and include units in your final answer.