

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 $P(2, -1)$ be a point on the graph of $f(x) = \frac{-5x+6}{x} + 1$.

a. Find the **slope of the secant line** passing through P and the point $Q(4, f(4))$. $f(4) = \frac{-5(4)+6}{4} + 1$

$$m = \frac{-\frac{7}{2} - (-1)}{4 - 2} = \frac{-\frac{5}{2}}{2} = \boxed{-\frac{5}{4}}$$

$$= \frac{-14}{4} + 1 = -\frac{7}{2}$$

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	1.9	1.99	1.999	2.001	2.01	2.1
$f(x)$	-0.8421	-0.9849	-0.9985	-1.0015	-1.0149	-1.1429
m_{sec}	-1.5789	-1.5075	-1.5008	-1.4993	-1.4925	-1.4286

Use the information in the table to estimate the **slope of the tangent line** to $f(x)$ at the point $P(2, -1)$.

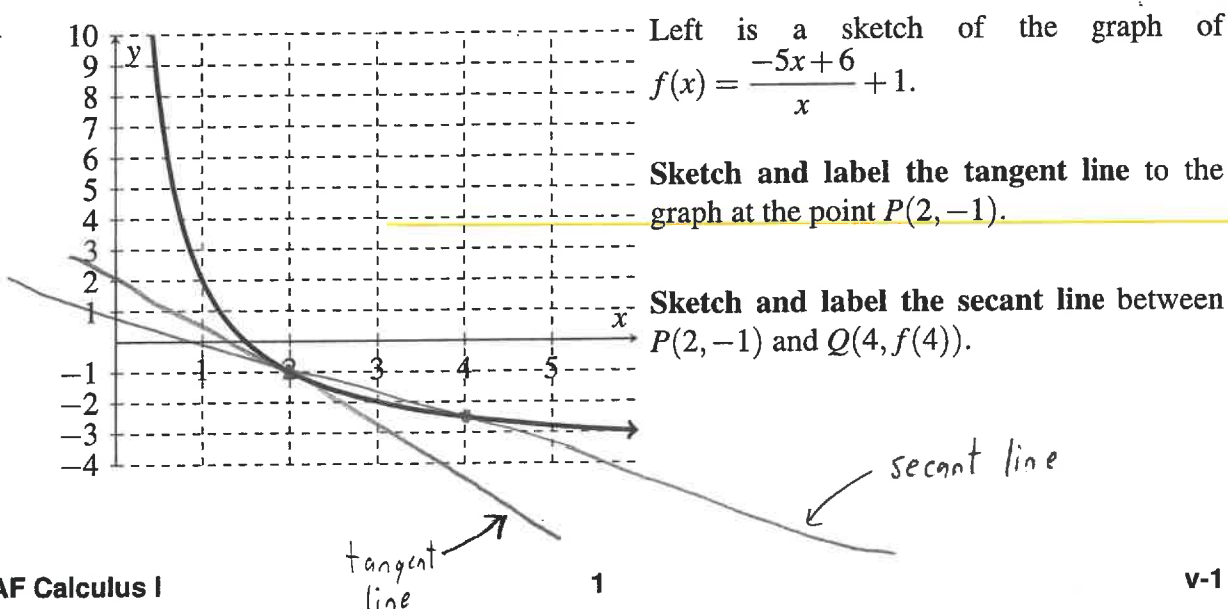
$$m \approx -1.5 = \boxed{-\frac{3}{2}}$$

c. Use the slope from part (b) above to write an **equation of the tangent line** at point $P(2, -1)$.

$$y - (-1) = -\frac{3}{2}(x - 2)$$

$$y + 1 = -\frac{3}{2}x + 3 \Rightarrow \boxed{y = -\frac{3}{2}x + 2}$$

d.



2. [5 points] A barrel going over the edge of Niagara falls has height function $h(t) = 51 - 5t^2$ meters, after t seconds have elapsed. Find the **average velocity** of the barrel between $t = 1$ and $t = 3$ seconds. Simplify and include units with your answer.

$$h(1) = 51 - 5(1)^2 = 46$$

$$h(3) = 51 - 5(3)^2 = 51 - 45 = 6$$

$$\text{average velocity} = \frac{46 - 6}{1 - 3} = \frac{40}{-2} = -20 \text{ meters per second}$$

20 meters per second downward

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

a. $\sin(3\pi/4) = \boxed{\frac{\sqrt{2}}{2}}$

b. $\cot(7\pi/6) = \frac{\cos(\frac{7\pi}{6})}{\sin(\frac{7\pi}{6})} = \frac{-\frac{\sqrt{3}}{2}}{-\frac{1}{2}} = \boxed{\sqrt{3}}$

c. $\arcsin\left(\cos\left(\frac{4\pi}{3}\right)\right) = \arcsin\left(-\frac{1}{2}\right)$
 $= \boxed{-\frac{\pi}{6}}$

d. $\arctan(-\sqrt{3}) = \boxed{-\frac{\pi}{3}}$

4. [2 points] Solve the equation $5^{x/3} = \frac{1}{25}$. Give an exact answer.

$$5^{\frac{x}{3}} = 5^{-2}$$

$$\frac{x}{3} = -2$$

$$\boxed{x = -6}$$