February 2, 2025

Math 1A Worksheet #6

Name: _____

1. A curve has equation $y = f(x)$.

   (a) Write an expression for the slope of the secant line through $P = (5, f(5))$ and $Q = (x, f(x))$. $\frac{x-5}{f(x)-f(5)}$

   (b) Write an expression for the slope of the tangent line at P. $f'(x)$

2. Find the equation of the tangent line to the parabola $f(x) = x^2 - 4x + 3$ at the point $(5, 8)$. $f'(5) = 2(5) - 4 = 6$ $y = 6(x-5) + 8$

3. Find the slope of the tangent line to the curve at $x = 1$ for each of the following graphs:

   (a) $y = 3x^2 + x - 5$ 7

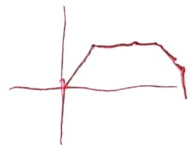
   (b) $y = x^3 - 2x$ 1

   (c) $y = \sqrt{x}$ $1/2$

   (d) $y = \frac{1}{x+1}$ $-1/2$

4. The following piecewise defined function defines the position $P(t)$ of a particle as a function of time t.

$$P(t) = \begin{cases} 2t & 0 \le 2t < \frac{5}{2} \\ 5 & \frac{5}{2} \le t < 7 \\ -t + 12 & 7 \le t < 10 \\ -3t + 32 & t \ge 10 \end{cases}$$



   (a) Sketch a graph of $P(t)$.

   (b) Sketch a graph of the *velocity function* of the particle.

5. Sketch the graph of a function $f(x)$ where $f(0) = 5$, $f'(1) = -1$, $f(2) = 2$, and $f'(3) = 2$.

6. Kaladin throws a ball into the air on the mysterious planet Roshar at a velocity of 55 ft/s, starting from a height of 6 ft. The height in feet after t seconds is given by $y = -12t^2 + 55t + 6$.

   (a) What is the velocity at $t = 2$? $-48 + 55 = 7$

   (b) At what time will the ball hit the ground? $\frac{-55 \pm \sqrt{55^2 + 4(6)(12)}}{24}$

   (c) What is the velocity at which the ball hits the ground? $-(-55 + \sqrt{\ldots}) + 55$ $= 110 - \sqrt{\ldots}$

(You may use calculator for (b), (c)).

Math 1A Spring 2025 Quiz 1

Name:

1. Find the domain of the function $\sqrt{3-t}+\sqrt{2+t}$. $t \leq 3$, $t \geq 2$ $\rightsquigarrow (-2, 3]$

2. Evaluate $f(-3), f(0), f(2)$ for the following piecewise function:

$$f(x) = \begin{cases} ||x|-1|, & x \leq -1 \\ (x+1)^3, & x > -1. \end{cases}$$

2
1
27

3. Determine if $g(x) = x^2 - x^7 + x^{10}$ is odd, even, or neither. Neither

4. Find the domain of the function $h(t) = \frac{1}{1-\sec^2 t}$.

$\sec^2(t) \neq \pm 1 \iff \cos(t) \neq \pm 1$ $\quad \mathbb{R} \setminus \{\pi k \mid k \in \mathbb{Z}\}$

5. The manager of a furniture factory finds that it costs \$2200 to manufacture 100 chairs in one day and \$4800 to manufacture 300 in one day.

   (a) Express the cost as a function of the number of chairs produced, assuming the relationship is linear. Cost = 13(chair) + 900

   (b) What is the slope of the function and what does it represent? 13 ~ \$/chair

   (c) What is the y-intercept of the function and what does it represent? 900 - op. cost baseline