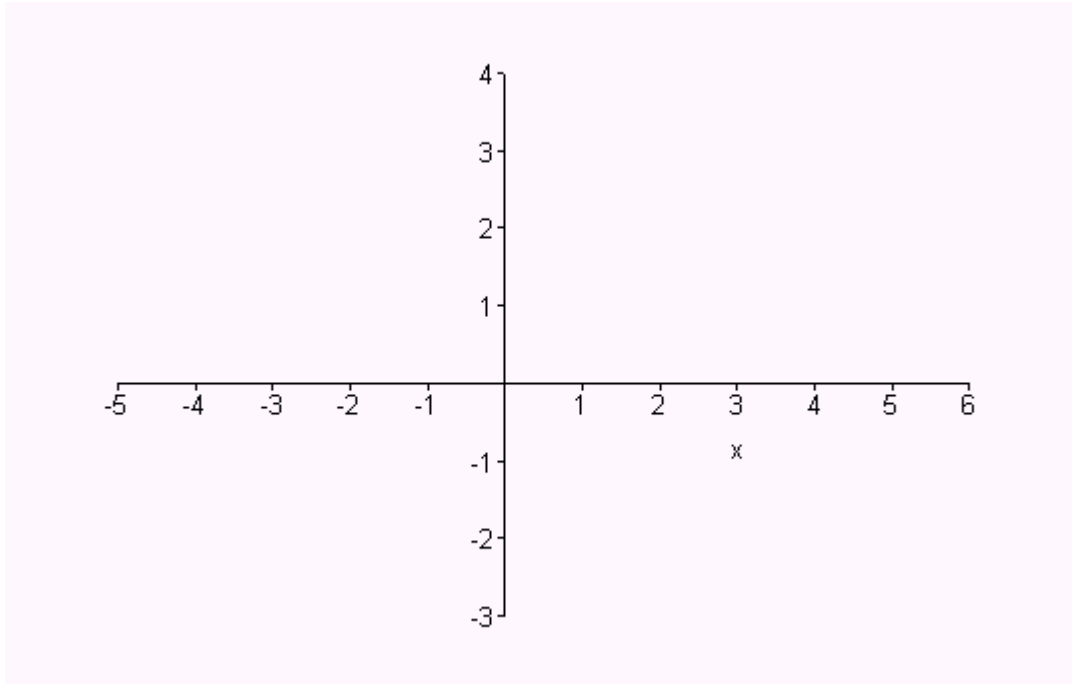


I. Use the graph of the function f below to answer the following questions. (2 points each – 32 total)



$$\begin{aligned}
 f(0) &= \underline{\hspace{2cm}} & f(2) &= \underline{\hspace{2cm}} & f(-2) &= \underline{\hspace{2cm}} \\
 \lim_{x \rightarrow -2^-} f(x) &= \underline{\hspace{2cm}} & \lim_{x \rightarrow 5} f(x) &= \underline{\hspace{2cm}} & \lim_{x \rightarrow -2} f(x) &= \underline{\hspace{2cm}} & \lim_{x \rightarrow 2} f(x) &= \underline{\hspace{2cm}} \\
 \lim_{x \rightarrow 4^-} f(x) &= \underline{\hspace{2cm}} & \lim_{x \rightarrow \infty} f(x) &= \underline{\hspace{2cm}} & \lim_{x \rightarrow -\infty} f(x) &= \underline{\hspace{2cm}} & \lim_{x \rightarrow 0} f(x) &= \underline{\hspace{2cm}}
 \end{aligned}$$

For the remaining questions, please write “true” or “false”, according to which is correct about the statement, in the space provided next to each statement.

- _____ f is continuous at $x = 2$.
- _____ f is continuous at $x = 5$.
- _____ f is continuous on the interval $[-2, 2]$
- _____ f is differentiable at $x = 5$.
- _____ $f'(0) < f'(-3)$

II. Determine if the function given by $f(x) = \begin{cases} \frac{\sin(16x)}{x}, & x < 0 \\ (x+4)^2, & 0 \leq x \end{cases}$ is continuous at $x = 0$. Clearly

justify your answer. (6 points)

III. For each of the following limits, determine if the limit exists as a number, exists in the infinite sense, or does not exist. If the limit exists find its value. You must show at least one intermediate step to receive full credit. (6 points each – 42 points total)

1. $\lim_{x \rightarrow \infty} \frac{5x^3 - x^2 + 2}{3 - x - 2x^3}$

2. $\lim_{x \rightarrow -1^-} \frac{2x^2 - x - 3}{x^2 + 2x + 1}$

3. $\lim_{\theta \rightarrow \pi/2} (\sin(3\theta) + 4\theta)$

4. $\lim_{w \rightarrow 2^-} \sqrt{w - 2}$

5. $\lim_{\theta \rightarrow 0^-} \theta \cos \frac{1}{\theta}$

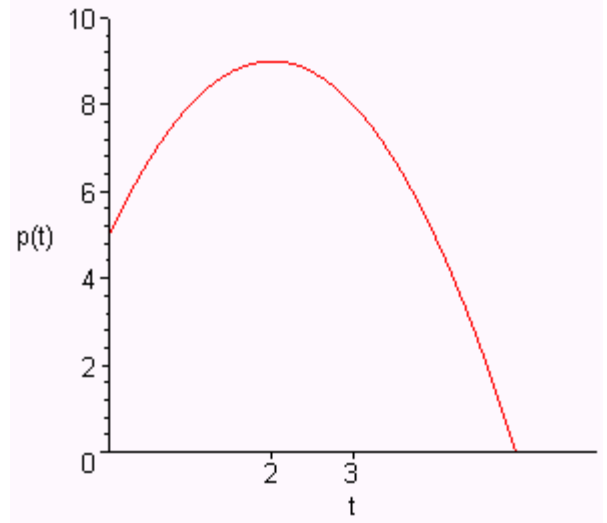
6. $\lim_{x \rightarrow 0} \frac{2 - \sqrt{4 + x^2}}{x}$

7. $\lim_{x \rightarrow -\infty} \frac{\sqrt{x^2 - 9}}{2x - 6}$

IV. A particle is moving along a straight path. Its position (in inches) is given by $p(t) = 5 + 4t - t^2$ where t is in seconds. Please answer the following: (12 points total)

(a) Find the velocity of the particle from time $t = 0$ to $t = 2$ seconds. Draw and clearly indicate the line on the graph whose slope represents this velocity. (4 points)

(b) Find the velocity of the particle at time $t = 3$ seconds. Draw and clearly indicate the line on the graph whose slope represents this velocity. (4 points)



(c) Find the equation of the tangent line to $p(t)$ at $t = 3$. (4 points)

V. Let $f(x) = \frac{3}{x^2}$. Use the definition of the derivative to find $f'(x)$. (8 points)