

State ACTM Calculus
Spring 2006

Select the best answer for each of the following.

1. Find the equation of the tangent line to $y = x^2$ at the point $P(1, 1)$.
 A. $y = 2x - 1$ B. $y = 2x + 1$ C. $y = 1/2x + 1/2$
 D. $y = 1/2x - 1/2$ E. None of these.

2. Find $\lim_{x \rightarrow 1} \frac{\sqrt{x-1}}{x^2-1}$.
 A. Doesn't Exist B. 0 C. 2 D. $-1/2$ E. None of these.

3. Find $\lim_{x \rightarrow 0} \sin\left(\frac{\pi}{x}\right)$.
 A. Doesn't Exist B. 0 C. -1 D. 1 E. None of these.

4. Which of the Following is False?
 A. $\lim_{x \rightarrow a} c = c$ for c a constant B. $\lim_{x \rightarrow a} \sqrt[n]{x} = a^n$ for $n > 0$ and $a > 0$.
 C. $\lim_{x \rightarrow a} x^n = a^n$ for n a positive integer D. $\lim_{x \rightarrow a} x = a$
 E. Three are True

5. If $f(x) = \begin{cases} \sqrt{x-4}, & x > 4 \\ 8-2x, & x < 4 \end{cases}$, find $\lim_{x \rightarrow 4} f(x)$.
 A. Doesn't Exist B. 4 C. 0 D. -4 E. None of these.

6. The Heaviside function H is defined by $H(t) = \begin{cases} 0, & t < 0 \\ 1, & t \geq 0 \end{cases}$. It is named after the electrical engineer Oliver Heaviside (1850-1925) and can be used to describe an electric current that is switched on at time $t = 0$. Find $\lim_{t \rightarrow 0} H(t)$.
 A. Doesn't Exist B. 0 C. 1 D. -1 E. None of these.

7. True or False: Any polynomial is continuous everywhere on $(-\infty, \infty)$.
 A. True B. False C. D. E.

8. True or False: Any rational Function is continuous wherever it is defined.
 A. True B. False C. D. E.

9. Given $f(x) = \begin{cases} cx + 1, & x \leq 3 \\ cx^2 - 1, & x > 3 \end{cases}$, for what value of c is f continuous on $(-\infty, \infty)$?
 A. $1/3$ B. 1 C. 0 D. 3 E. None of these.

