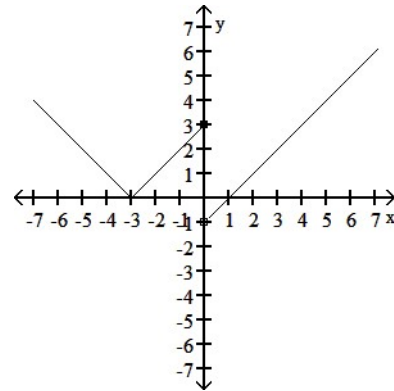


TMATYC
Calculus A Test Fall 2010

1.

Find $\lim_{x \rightarrow 0^-} f(x)$ and $\lim_{x \rightarrow 0^+} f(x)$



- A) Does not exist; does not exist B) 3; Does not exist
C) -1; 3 D) 3; -1

2. Find the limit, if it exists. $\lim_{x \rightarrow 5} \frac{x-5}{|x-5|}$

- A) 0 B) -1 C) 1 D) Does not exist

3. If the limit at infinity exists, find the limit. $\lim_{x \rightarrow \infty} \frac{3x^3 + 5x}{4x^4 + 10x^3 + 2}$

- A) $\frac{3}{4}$ B) 1 C) 0 D) ∞

4. Suppose that the cost C of removing $p\%$ of the pollutants from a chemical dumping site is given by $C(p) = \frac{\$35000}{100-p}$. Can a company afford to remove 100% of the pollutants?

Explain.

- A) Yes, the cost of removing $p\%$ of the pollutants is \$ 350, which is certainly affordable.
B) No, the cost of removing $p\%$ of the pollutants increases without bound as p approaches 100.
C) No, the cost of removing $p\%$ of the pollutants is \$ 350, which is a prohibitive amount of money.
D) Yes, the cost of removing $p\%$ of the pollutants is \$ 35,000, which is certainly affordable.

5. Determine where the function $H(x) = \frac{x^2 + 7}{x^2 + x - 6}$ is continuous.

- A) $(-\infty, -3) \cup (-3, 2) \cup (2, \infty)$ B) $(-\infty, -3)$
C) $(-3, 2) \cup (2, \infty)$ D) $(-\infty, -3) \cup (-3, 2)$

6. Find the instantaneous rate of change for the function at the value given:

$$y = x^2 + 10x \quad \text{at } x = 4.$$

- A) 56 B) 8 C) 14 D) 18

7. Find the slope of the line tangent to the graph of the function at the given value of x .

$$y = \tan^3(x) \quad \text{at } x = \frac{\pi}{4}$$

- A) 12 B) 6 C) 9 D) -1

8. Find the equation of the tangent line to the graph of the function at the given value of x .

$$y = x^2 + 5x + x \quad \text{at } x = 4$$

- A) $y = \frac{1}{20}x + \frac{1}{5}$ B) $y = -\frac{4}{25}x + \frac{8}{5}$
C) $y = 14x - 16$ D) $y = -39x - 80$

9. Suppose an object moves along the y -axis so that its location is given by $y = f(x) = x^2 + x$ at time x (where y is in meters and x is in seconds). Find the instantaneous velocity of the object at $x = 4$ seconds.

- A) 20 m/s B) 8 m/s C) 9 m/s D) 10 m/s

10. Let f and g be functions that satisfy $f'(4) = 2$ and $g'(4) = -3$ and $f(4) = g(4) = -2$. Find $h'(4)$ for $h(x) = \frac{[f(x)]^2}{g(x)}$.
- A) 7 B) 11 C) 9 D) 2
11. Find $\frac{dy}{dx}$ for $y = \frac{1}{3x^3} + \frac{x^7}{10}$.
- A) $\frac{7x^6}{9x^2 + 10}$ B) $-x^{-2} + \frac{7}{10}x^7$
 C) $-x^{-4} + \frac{7}{10}x^6$ D) $\frac{1}{9x^2} + \frac{7x^6}{10}$
12. A spherical balloon is being inflated. Find the approximate change in volume if the radius increases from 6.0 cm to 6.1 cm. (Recall that $V = \frac{4}{3}\pi r^3$.)
- A) $0.24\pi \text{ cm}^3$ B) $144\pi \text{ cm}^3$ C) 288 cm^3 D) $14.4\pi \text{ cm}^3$
13. Suppose the demand for a certain item is given by $D(p) = -3p^2 + 8p + 4$, where p represents the price of the item. Find $D'(p)$, the rate of change of demand with respect to price.
- A) $D'(p) = -6p + 8$ B) $D'(p) = -3p + 8$
 C) $D'(p) = -6p^2 + 8$ D) $D'(p) = -3p^2 + 8$
14. Radioactive carbon-14 has a continuous compound rate of decay of $r = -0.000124$. Estimate the age of a skull uncovered at an archaeological site if 6% of the original amount of carbon-14 is still present. (Compute answer to the nearest year.)
- A) 124,027 yr B) 22,689 yr
 C) 470 yr D) 20,032 yr

15. Given $f(x) = 7e^{x^2} - 3^{\cos(x)}$, find $f'(x)$

A) $14xe^{x^2} + \frac{3^{\cos(x)} \sin(x)}{\ln(3)}$

B) $14xe^{x^2} + \ln(3)[3^{\cos(x)} \sin(x)]$

C) $14xe^{x^2} - 3(3^{\cos(x)} \sin(x))$

D) $14xe^{x^2} + \frac{1}{3}(3^{\cos(x)} \sin(x))$

16. Use appropriate properties of logarithms to rewrite $f(x)$ and then find $f'(x)$.

$$f(x) = 1 + \ln \frac{5}{x^4}$$

A) $\frac{5}{x}$

B) $-\frac{5}{x}$

C) $-\frac{4}{x}$

D) $1 - \frac{4}{x}$

17. Find $\frac{dy}{dx}$ for the indicated function y . $y = 9^x$

A) $\frac{9^x}{\ln 9}$

B) $9^x \ln 9$

C) $9 \ln 9$

D) $9^x \ln x$

18. Differentiate. Find $f'(x)$ for $f(x) = (5x^3 + 4)(3x^7 - 5)$.

A) $f'(x) = 150x^9 + 84x^6 - 75x^2$

B) $f'(x) = 20x^9 + 84x^6 - 75x$

C) $f'(x) = 150x^9 + 84x^6 - 75x$

D) $f'(x) = 20x^9 + 84x^6 - 75x^2$

19. Find $\frac{dy}{dx}$ for $y = \frac{2x-5}{7x^2+4}$.

A) $\frac{dy}{dx} = \frac{42x^2 - 70x + 8}{(7x^2 + 4)^2}$

B) $\frac{dy}{dx} = \frac{-14x^2 + 70x + 8}{(7x^2 + 4)^2}$

C) $\frac{dy}{dx} = \frac{14x^3 - 28x^2 + 78x}{(7x^2 + 4)^2}$

D) $\frac{dy}{dx} = \frac{-14x^2 + 62x + 28}{(7x^2 + 4)^2}$

24. Find $\frac{dy}{dx}$ by implicit differentiation: $2xy - y^2 = 1$

A) $\frac{dy}{dx} = \frac{y}{y-x}$

B) $\frac{dy}{dx} = \frac{x}{x-y}$

C) $\frac{dy}{dx} = \frac{x}{y-x}$

D) $\frac{dy}{dx} = \frac{y}{x-y}$

25. Find the derivative: $y = x^3 \cos(8x^2)$

A) $y' = -16x^4 \sin(8x^2)$

B) $y' = -16x^4 \sin(8x^2) + 3x^2 \cos(8x^2)$

C) $y' = 16x^4 \sin(8x^2) + 3x^2 \cos(8x^2)$

D) $y' = \sin(8x^2) + 3x^2 \cos(8x^2)$