A.P. CALCULUS - QUARTERLY EXAM

<u>Directions</u>: Answer each problem on the scantron sheet. Gauge your time**.** You have the period to complete the exam. If you do not know an answer, leave it blank. **NO CALCULATORS PERMITTED.**

1. Determine $\lim\limits_{x \to 1} f(x)$ if $f(x) = \begin{cases} 3 - x, & x \neq 1 \\ 1 & , x = 1 \end{cases}$

    a. 2   **b.** 1   **c.** $\dfrac{3}{2}$ **d.** Does not exist   **e.** None of these

2. Find $f'(x)$ for $f(x) = \left(2x^2 + 5\right)^7$

    a. $7(4x)^6$ **b.** $7(4x)^7$ **c.** $28x\left(2x^2 + 5\right)^6$ **d.** $7\left(2x^2 + 5\right)^6$ **e.** None of these

3. Find $\dfrac{dy}{dx}$ if $x^2 + y^2 = 2xy$

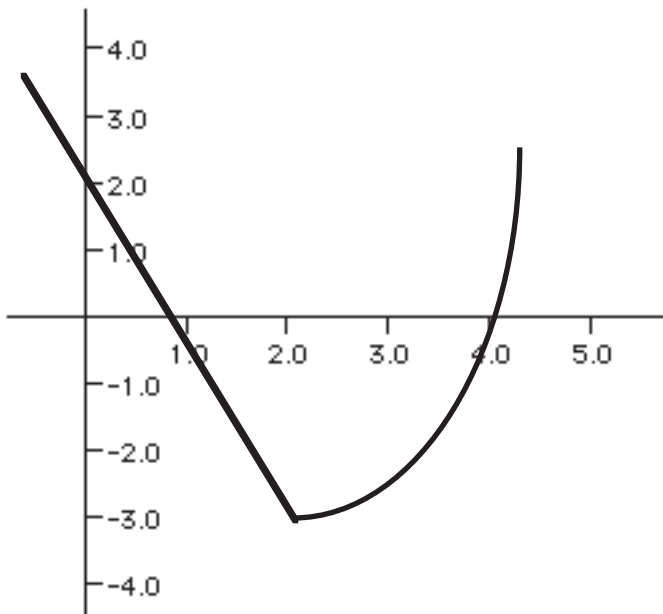   **a.** $\dfrac{x}{x - y}$ **b.** $\dfrac{y + x}{y - x}$ **c.** 1   **d.** $\dfrac{-x}{y}$ **e.** None of these

4. Use the graph of $f(x)$ above to estimate $\lim\limits_{x \to 2} f(x)$
    a. Does not exist   **b.** 0   **c.** -3   **d.** 2   **e.** None of these
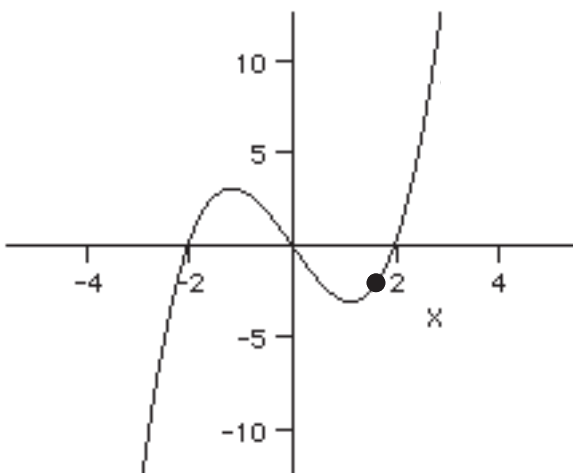
5. Determine whether the slope at the indicated point is

    a. Positive   **b.** Zero   **c.** Negative   **d.** No Slope   **e.** None of these

6. Find $\displaystyle\lim_{x\to 1}\frac{5}{(x-1)^2}$

    a. 0   **b.** $-\infty$ **c.** $\dfrac{5}{4}$ **d.** ∞ **e.** None of these

7. Find $f'(x)$: $f(x)=\dfrac{x^2-3x}{x^2}$

    a. $\dfrac{2x-3}{x^2}$ **b.** $\dfrac{2x-3}{2x}$ **c.** $1-\dfrac{3}{x}$ **d.** $\dfrac{3}{x^2}$ **e.** None of these

8. Find $\displaystyle\lim_{x\to -1}\frac{x^2+2x+3}{x^2+1}$

    a. 0   **b.** 1   **c.** ∞ **d.** Does not exist   **e.** None of these

9. If $f(x)=-x^2+x$, which of the following will calculate the derivative of $f(x)$?

    a. $\displaystyle\lim_{\Delta x\to 0}\frac{\left(-x^2+x+\Delta x\right)-\left(-x^2+x\right)}{\Delta x}=-x^2+x$ **b.** $\displaystyle\lim_{\Delta x\to 0}\frac{\left[-(x+\Delta x)^2+(x+\Delta x)\right]-\left(-x^2+x\right)}{\Delta x}$

    c. $\dfrac{\left[-(x+\Delta x)^2+(x+\Delta x)\right]-\left(-x^2+x\right)}{\Delta x}$ **d.** $\dfrac{\left(-x^2+x+\Delta x\right)-\left(-x^2+x\right)}{\Delta x}$ **e.** None of these

10. Find $\lim\limits_{x \to 5} \dfrac{x^2 - 3x - 10}{x - 5}$

    a. 2   **b.** Does not exist   **c.** 0   **d.** 7   **e.** None of these

11. If $f(x) = \sin(2x)$, find $f''(x)$

    a. $2\cos(2x)$ **b.** $-4\sin(2x)$ **c.** $-2\sin(2x)$ **d.** $-4\sin x$ **e.** None of these

12. If $f(x) = \begin{cases} x^2 + 3x - 1, & x \le 2 \\ -3bx + 3, & x < 2 \end{cases}$, find the value of b in order for f to be continuous.

    a. -1   **b.** -2   **c.** 2   **d.** 1   **e.** None of these

13. For which of these functions $f(x)$ does $\lim\limits_{x \to -\infty} f(x) = 2$?

    a. $\dfrac{x-2}{3x-5}$ **b.** $\dfrac{2x}{\sqrt{x-2}}$ **c.** $\dfrac{2x^2 - 6x + 1}{1 + x^2}$ **d.** $\dfrac{2x-1}{x^2+1}$ **e.** None of these

14. Find an equation of the tangent line to the graph of $f(x) = x \sin x$ when $x = 0$.

    a. $y = 0$ **b.** $f'(x) = 0$ **c.** $y = x\cos x + \sin x$ **d.** $y = x$ **e.** None of these

15. Find $\dfrac{dy}{dx}$ for $y = \sin(x + y)$

    a. 0   **b.** $\dfrac{\cos(x+y)}{1 - \cos(x+y)}$ **c.** $\cos(x+y)$ **d.** 1   **e.** None of these

16. Find $\dfrac{d^2y}{dx^2}$ for $y = \dfrac{x+3}{x-1}$

    a. 0   **b.** $y = \dfrac{-8}{(x-1)^3}$ **c.** $y = \dfrac{-4}{(x-1)^3}$ **d.** $y = \dfrac{8}{(x-1)^3}$ **e.** None of these

17. Which of the following describes the graph of $y = |2x + 6|$?

    a. only continuous   **b.** only differentiable   **c.** both a and b
    d. not continuous, not differentiable   **e.** constant

18. Find $f'(x)$ if $f(x) = \sin^3 4x$

    a. $4\cos^3 4x$ **b.** $3\sin^2 4x \cos 4x$ **c.** $\cos^3 4x$ **d.** $12\sin^2 4x \cos 4x$ **e.** None of these

19. If $f(1) = 4$ and $f'(1) = 2$, find an equation of the tangent line at $x = 1$.

    a. $y = 2x + 2$ **b.** $y = 2x - 2$ **c.** $y = 4x - 7$ **d.** $y = 4x - 2$ **e.** None of these

20. Find the equation of the line that passes through (1, 3) and is perpendicular to the line $2x + 3y + 5 = 0$

    a. $3x - 2y + 3 = 0$ **b.** $2x + 3y - 11 = 0$ **c.** $2x + 3y - 9 = 0$ **d.** $3x - 2y - 7 = 0$ **e.** None of these

21. Find an equation of the tangent line to the graph of $x^2 + 3y^2 = 4$ at the point $(1,1)$

    a. $y + 1 = \dfrac{-1}{3}(x+1)$ **b.** $y - 1 = \dfrac{-x}{3y}(x-1)$ **c.** $x + 3y = 2$

    d. $y - 1 = \dfrac{-1}{3}(x-1)$ **e.** None of these

22. Find the derivative of $x^2 f(x)$

    a. $x[xf'(x)+2f(x)]$ **b.** $2xf'(x)$ **c.** $x[xf(x)+2f'(x)]$

    d. $x^2 f'(x)$ **e.** None of these

23. Let $f(7)=0,\ f'(7)=14,\ g(7)=1,\ g'(7)=\dfrac{1}{7}$. Find $h'(7)$ if $h(x)=\dfrac{f(x)}{g(x)}$

    a. 98   **b.** -14   **c.** -2   **d.** 14   **e.** None of these

24. Which of the following functions does **not** have a derivative of 0?

    a. $y=\dfrac{-1}{1000}$ **b.** $y=4\pi^2-9$ **c.** $y=\sin^2 x+\cos^2 x$ **d.** $y=\csc x\tan x\cos x$ **e.** All do

25. Find $\displaystyle\lim_{x\to 0}\dfrac{\sqrt{x+9}-3}{x}$

    a. 0   **b.** 1   **c.** ∞ **d.** $\dfrac{1}{3}$ **e.** None of these

26. Find all points on the graph of $f(x)=-x^3+3x^2-2$ where there is a horizontal tangent line.

    a. (0, -2), (2, 2)   **b.** (0, -2)   **c.** (1, 0), (0, -2)   **d.** (2, 2)   **e.** None of these

27. If $f(x)=x^2+1$ and $g(x)=2x-1$, find $\dfrac{d}{dx}\big[f'(g(x))\big]$ at $x=1$.

    a. 2   **b.** 6   **c.** 4   **d.** 0   **e.** None of these