

Multiple Choice: Write the letter of the appropriate response to the left of the exercise number. Show all work.

\_\_\_\_\_ 1. If  $f(2)=3$ ,  $f(3)=2$ , and  $f'(2)=-2$ , then find the equation of the normal line when  $x=2$ .

- A.  $y-2=-2(x-3)$                       B.  $y-2=-2(x-3)$   
 C.  $y+3=2(x+2)$                       D.  $y-3=-\frac{1}{2}(x-2)$   
 E. None of these

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

- A.  $\lim_{h \rightarrow 0} \frac{(-x^2+x+h)-(-x^2+x)}{h}$   
 B.  $\lim_{h \rightarrow 0} \frac{\left[(-(x+h)^2+(x+h))\right]-(-x^2+x)}{h}$   
 C.  $\frac{\left[(-(x+h)^2+(x+h))\right]-(-x^2+x)}{h}$   
 D.  $\frac{(-x^2+x+h)-(-x^2+x)}{h}$   
 E. None of these

\_\_\_\_\_ 3. Let 

$f(3)=0$	$f'(3)=6$
$g(3)=1$	$g'(3)=\frac{1}{3}$

 . Find  $h'(3)$  if  $h(x)=\frac{f(x)}{g(x)}$ .

- A. 18  
 B. 6  
 C. -6  
 D. -2  
 E. None of these

\_\_\_\_\_ 4. Find the derivative of the function.  $f(x) = -8x^2 - 4\cos x$

- A.  $f'(x) = -8x + 4\sin x$
- B.  $f'(x) = -16x - 4\sin x$
- C.  $f'(x) = -16x + 4\sin x$
- D.  $f'(x) = -16x - 4\cos x$
- E. None of these

\_\_\_\_\_ 5. Find  $\frac{d^2y}{dx^2}$  if  $y = \frac{x+2}{x-3}$

- A.  $\frac{-2}{(x-3)^2}$
- B. 0
- C.  $\frac{-10}{(x-3)^3}$
- D.  $\frac{2}{(x-3)^2}$
- E. None of these

\_\_\_\_\_ 6. Determine the value(s), if any, at which the graph of the function has a horizontal tangent.

$$y = \frac{8}{x-6}$$

- A. 8
- B. 8 and 6
- C. 8 and -6
- D. 6
- E. There are no values for which the function has a horizontal tangent line.

\_\_\_\_\_ 7. Find  $r'(t)$  if  $r(t) = (t^5 + 3)^4$

- A.  $r'(t) = 4t^4 (t^5 + 3)^3$
- B.  $r'(t) = 20t^4 (t^5 + 3)^3$
- C.  $r'(t) = 20t^6 (t^5 + 3)^3$
- D.  $r'(t) = 20t^5 (t^5 + 3)^3$
- E. None of these

\_\_\_\_\_ 8. Find the derivative if the function if  $f(x) = x^5\sqrt{8-2x}$

A.  $f'(x) = \frac{x^4(40-11x)}{\sqrt{8-2x}}$

B.  $f'(x) = \frac{x^4(40+11x)}{\sqrt{8-2x}}$

C.  $f'(x) = \frac{x^4(4-11x)}{\sqrt{8-2x}}$

D.  $f'(x) = \frac{x^4(40-x)}{\sqrt{8-2x}}$

E. None of these

\_\_\_\_\_ 9. Find the derivative if the function if  $f(x) = 3\sec^2(5\pi x-3)$

A.  $f'(x) = 30\pi \sec^2(5\pi x-3) \tan(5\pi x-3)$

B.  $f'(x) = 30\sec^2(5\pi x-3) \tan(5\pi x-3)$

C.  $f'(x) = 5\pi \sec^2(5\pi x-3) \tan(5\pi x-3)$

D.  $f'(x) = 15\pi \sec^2(5\pi x-3) \tan(5\pi x-3)$

E. None of these

\_\_\_\_\_ 10. Find  $\frac{dy}{dx}$  by implicit differentiation if  $x^2 + 9x + 9xy - y^2 = 16$

A.  $\frac{dy}{dx} = \frac{x+9+9y}{y-9x}$

B.  $\frac{dy}{dx} = \frac{2x+9+9y}{2x-9y}$

C.  $\frac{dy}{dx} = \frac{2x-9+9y}{2y-9x}$

D.  $\frac{dy}{dx} = \frac{2x+9+9y}{2y-9x}$

E. None of these

11. Find  $\frac{d^2y}{dx^2}$  in terms of  $x$  and  $y$  if  $2-8xy=9x-5y$

A.  $\frac{d^2y}{dx^2} = \frac{16(8y-9)}{(5-8x)^2}$

B.  $\frac{d^2y}{dx^2} = \frac{464}{(5-8x)^3}$

C.  $\frac{d^2y}{dx^2} = \frac{16(8y+9)}{(5-8x)^2}$

D.  $\frac{d^2y}{dx^2} = \frac{16(8+9y)}{(5+8x)^2}$

E. None of these

12. Suppose the functions  $f$  and  $g$  and their derivatives with respect to  $x$  have the following values at  $x=0$  and  $x=1$ .

Evaluate the derivative with respect to  $x$  of  $f(g(x))$  at  $x=0$ . Show the work that leads to your solutions.

$x$	$f(x)$	$g(x)$	$f'(x)$	$g'(x)$
0	1	1	5	$\frac{1}{3}$
1	3	-4	$-\frac{1}{3}$	$-\frac{8}{3}$

13. Let  $f$  and  $g$  be inverse functions.

The following table lists a few values of  $f$ ,  $g$ , and  $f'$ .

$x$	$f(x)$	$g(x)$	$f'(x)$
2	1	9	$\frac{1}{3}$
9	2	10	$\frac{1}{12}$

$g'(2) = \boxed{\phantom{000}}$

14-17. Find the derivative of each function. Show all work.

14.  $\frac{d}{dx}(\operatorname{arcsec}(\ln x))$

16.  $y = (2x+1)6^x$

15.  $y = \left(\frac{10x^3}{\sqrt{x+1}}\right)^4$

17.  $f(x) = (2x + 1)^{3x}$