

## AP Calculus

## Pretest Number 2 Derivatives Test

Name \_\_\_\_\_

Date \_\_\_\_\_

1. If  $f(x) = \cos^4 x$ , then  $f'(\frac{\pi}{3}) =$

- a)  $-\frac{\sqrt{3}}{4}$       b) 2      c)  $\frac{1}{2}$   
 d)  $\frac{4}{\sqrt{3}}$       e)  $\frac{\sqrt{3}}{2}$

2. If  $f(x) = \pi - \sin x + (\pi x)$ , then  $f'(\pi) =$

- a)  $\frac{\pi}{2}$       b)  $\frac{4}{\pi}$       c)  $\pi + 1$   
 d)  $\pi - 1$       e)  $2\pi$

3. Differentiate:  $\frac{1 + \cos x}{1 - \cos x}$

- a)  $-1$       b)  $-2 \csc x$       c)  $2 \csc x$   
 d)  $\frac{-2 \sin x}{(1 - \cos x)^2}$       e)  $\frac{-\sin^2 x}{(1 + \cos x)^2}$

4. If  $y = \ln \frac{5-x}{5+x}$ , then  $\frac{dy}{dx} =$

- a)  $\frac{10}{x^2 - 25}$       b)  $\frac{10}{x^2 + 25}$       c)  $\frac{5}{x^2 - 25}$   
 d)  $\frac{5}{x^2 + 25}$       e)  $\frac{10}{x^2 - 10}$

5. A function  $f$  is defined by  $f(x) = \frac{e^{2x} - e^{-x}}{e^x + e^{-2x}}$ . Find  $f'(0)$ .

- a)  $-\frac{2}{3}$       b)  $2e - 1$       c)  $e$   
 d)  $\frac{3}{2}$       e)  $-\frac{3}{2}$

6. Given  $f(x) = e^{\sqrt{2x}}$ , find  $f'(2)$ .

- a)  $e^2$       b)  $2e$       c)  $\frac{e^2}{4}$       d)  $\frac{1}{e}$       e)  $\frac{e^2}{2}$

7. Given  $f(5) = 4$ ,  $f'(5) = 2$ ,  $g(5) = 6$ , and  $g'(5) = -7$ . Find  $h'(5)$  if  $h(x) = f(x) \times g(x)$ .

- a)  $-16$       b)  $40$       c)  $-50$       d)  $50$       e)  $14$

8. The point  $(-4, 2\sqrt{3})$  lies on the graph of  $y = \sqrt{x^2 - 4}$ . Find the slope of the line tangent to the curve at that point.

- a)  $-\frac{2\sqrt{3}}{3}$       b) 4      c)  $\frac{2\sqrt{3}}{3}$   
 d)  $\frac{4\sqrt{3}}{3}$       e)  $4\sqrt{3}$

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9. Let  $f(x) = \tan x$  for  $0 \leq x \leq 2\pi$ , and let  $g(x) = \ln x$  for all  $x > 0$ . Let  $S$  be the composition of  $g$  with  $f$ ,  $S(x) = g(f(x))$ . Find the slope of the tangent to the graph of  $S$  at  $x = \frac{\pi}{4}$ .
- a) 1      b) 2      c)  $2\pi$       d)  $\frac{1}{\sqrt{2}}$       e)  $\sqrt{3}$
10. The graph of  $f(x) = \frac{-5x^2}{7+x^2}$  has a horizontal tangent at  $y =$
- a)  $-5$       b)  $5$       c)  $\sqrt{7}$       d)  $-\sqrt{7}$       e)  $0$
11. The  $x$  coordinate(s) of the point(s) on the graph of  $f(x) = (x)^{2/3}(x^2 - 27)$  where vertical tangent(s) exist are
- a)  $-3$  only      b)  $0$  only      c)  $3$  only  
d)  $27$  only      e)  $9, -3$
12. Find an equation of the tangent line to the curve  $y = \ln(x - 3)$  at the point where the curve intersects the  $x$ -axis.
- a)  $y = x + 4$       b)  $y = x - 4$       c)  $y = x - 3$   
d)  $y = x + 3$       e)  $y = 3x$
13. Given a curve defined by the equation  $f(x) = (1 + \ln x)^2$ , find  $f'''(e^2)$ .
- a)  $e^2$       b)  $0$       c)  $4e^2$   
d)  $-4e^{-4}$       e)  $-4e^2$
14. Differentiate:  $f(x) = \tan^{-1}\left(\frac{x}{7}\right)$
- a)  $\frac{7}{x^2 + 49}$       b)  $\frac{7}{x^2 - 49}$       c)  $-\frac{7}{x^2 - 49}$   
d)  $-\frac{7}{x^2 + 49}$       e)  $\frac{1}{7}$
15. Find  $f'(x)$  given  $f(x) = \cos^4(3x)$ .
- a)  $4 \cos^3(3x)$       b)  $-12 \sin 3x \cos^3(3x)$   
c)  $-4 \cos^3(3x)$       d)  $12 \sin^3 3x \cos(3x)$   
e)  $12 \cos^2(3x)$

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16. If  $y = -3(\cos^2 x + \sin^2 x)^4$ , then the first derivative of  $y$  is
- a)  $-3$   
b)  $-12(\cos^2 x + \sin^2 x)^3$   
c)  $12(\cos^2 x + \sin^2 x)^3(2 \cos x + 2 \sin x)$   
d)  $-12 \cos 4x$   
e)  $0$
17. What is the slope of the tangent line to  $3xy - 5 \ln 4x = \frac{3}{4}$  at the point  $(\frac{1}{4}, 1)$ ?
- a)  $\frac{68}{3}$     b)  $-\frac{68}{3}$     c)  $-\frac{92}{3}$     d)  $\frac{3}{92}$     e)  $-17$
18. A rectangle has a fixed area of  $100 \text{ units}^2$  and its length  $L$  is increasing at  $2 \text{ units/sec}$ . Find the length  $L$  at the instant the width is decreasing at  $0.5 \text{ units/sec}$ .
- a)  $10$     b)  $15$     c)  $20$     d)  $25$     e)  $52$
19. A spherical balloon is inflated at the rate of six cubic feet per minute. At what rate is the radius changing when  $r = 18 \text{ in}$ ?
- a)  $\frac{1}{4\pi} \text{ in/min}$     b)  $\frac{2}{\pi} \text{ in/min}$     c)  $\frac{2\pi}{3} \text{ in/min}$   
d)  $\frac{3}{2\pi} \text{ in/min}$     e)  $\frac{2}{3\pi} \text{ ft/min}$
20. Sand is falling of a conveyor onto a conical pile at the rate of  $20 \text{ feet}^3$  per minute. The diameter of the base of the cone is four times the altitude. At what rate is the height of the pile changing when it is  $8 \text{ feet}$  high?
- a)  $\frac{5}{64\pi} \text{ ft/min}$     b)  $\frac{64}{5\pi} \text{ ft/min}$     c)  $\frac{5}{16\pi} \text{ ft/min}$   
d)  $\frac{16\pi}{5} \text{ ft/min}$     e)  $\frac{5}{24\pi} \text{ ft/min}$
21. What is  $\lim_{h \rightarrow 0} \frac{\sqrt[3]{27+h} - \sqrt[3]{27}}{h}$ ?
- a)  $\frac{1}{27}$     b)  $\frac{1}{9}$     c)  $\frac{1}{81}$     d)  $\frac{1}{3}$     e)  $0$

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22. The functions  $f$  and  $g$  are differentiable and have the values shown in the table.

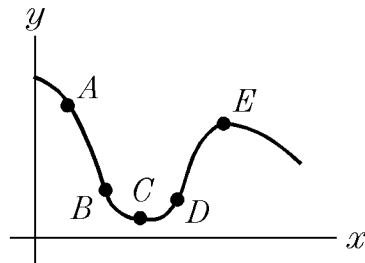
If  $A = f(g(x))$  then  $A'(-6) =$

- a) 0      b) -54  
 c) 99     d) 108  
 e) 72

$x$	$f$	$f'$	$g$	$g'$
-8	4	3	-2	6
-6	10	12	0	9
-2	20	9	6	18
0	30	11	12	24

23. At which of the five points shown on the graph is  $\frac{dy}{dx}$  negative? Choose the *best* answer.

- a) A and B  
 b) B only  
 c) C only  
 d) C, D, and E  
 e) D only



24. If  $y = e^{\ln(\sin x)}$ , then  $\frac{dy}{dx} =$

- a)  $\ln(\cos x)$       b)  $\ln x$       c)  $\cos x$   
 d)  $\frac{\cos x}{\ln x}$       e)  $\frac{\sin x}{\ln x}$

25. Let  $y^2 e^{2x} + 3x = y^3$ . Find  $y'$ .

- a)  $\frac{2y^2 e^{2x} + 3}{3y^2 - 2ye^{2x}}$       b)  $\frac{e^{2x} - 3}{4}$       c)  $\frac{ye^{2x} + 3}{y - e^{2x}}$   
 d)  $\frac{1 - 3y}{e^{2x}(3 - 2y)}$       e)  $\frac{e^{2x} - 3y}{e^{2x} - y^2}$

1.  
Answer: a  
CodePath: EAS.APC.E.B.9

2.  
Answer: c  
CodePath: EAS.APC.E.B.13

3.  
Answer: d  
CodePath: EAS.APC.E.B.21

4.  
Answer: a  
CodePath: EAS.APC.E.B.36

5.  
Answer: d  
CodePath: EAS.APC.E.B.46

6.  
Answer: e  
CodePath: EAS.APC.E.B.47

7.  
Answer: a  
CodePath: EAS.APC.E.B.64

8.  
Answer: a  
CodePath: EAS.APC.E.C.14

9.  
Answer: b  
CodePath: EAS.APC.E.C.18

10.  
Answer: e  
CodePath: EAS.APC.E.C.20

11.  
Answer: b  
CodePath: EAS.APC.E.C.35

12.  
Answer: b  
CodePath: EAS.APC.E.C.42

13.  
Answer: d  
CodePath: EAS.APC.E.D.30

14.  
Answer: a  
CodePath: EAS.APC.E.E.26

15.  
Answer: b  
CodePath: EAS.APC.E.F.34

16.  
Answer: e  
CodePath: EAS.APC.E.F.48

17.  
Answer: a  
CodePath: EAS.APC.E.G.24

18.  
Answer: c  
CodePath: EAS.APC.E.J.41

19.  
Answer: e  
CodePath: EAS.APC.E.J.46

20.  
Answer: a  
CodePath: EAS.APC.E.J.52

21.  
Answer: a  
CodePath: EAS.APC.D.A.19

22.  
Answer: c  
CodePath: EAS.APC.D.B.22

23.  
Answer: a  
CodePath: EAS.APC.D.D.4

24.  
Answer: c  
CodePath: EAS.APC.D.N.17

25.  
Answer: a  
CodePath: EAS.APC.D.N.58