

A decorative border with ornate floral and scrollwork designs in each of the four corners, framing the central text.

PRETEST  
2014

AP Calculus

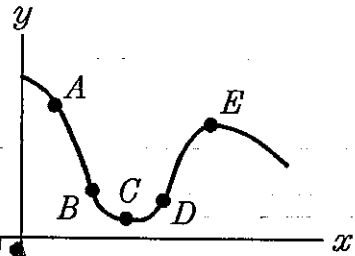
Chapter 3 Test

(Pretest)

Hopkins

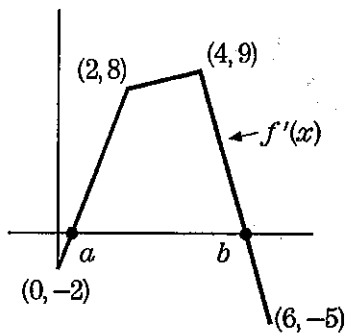
1. At which of the five points shown on the graph are  $\frac{dy}{dx}$  and  $\frac{d^2y}{dx^2}$  both negative?

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



ANSWERS  
1. C

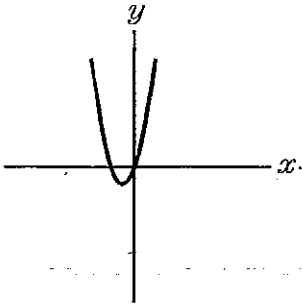
2.



The graph of  $f'$  is shown. If  $f(2) = 17$ , then  $f(0) = \underline{\hspace{2cm}}$ .

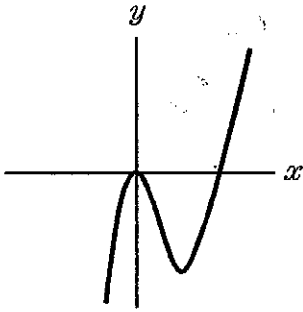
- a) 1      b) -1      c) 2      d) -33      e) 10

3.

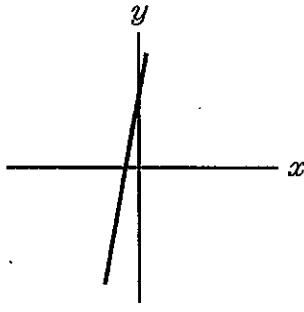


Given the graph of  $f$  shown above, which of the following is the graph of the derivative,  $f'$ ?

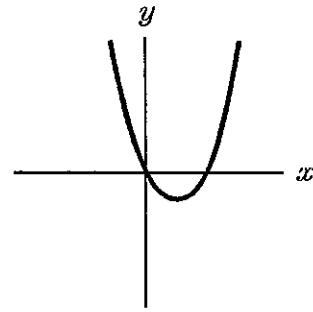
a)



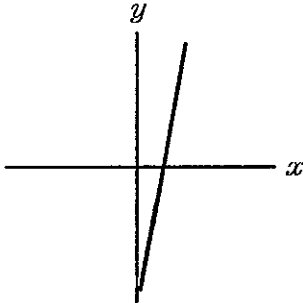
b)



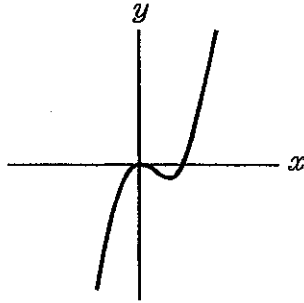
c)



d)



e)



4. Let  $f$  be defined by  $f(x) = (x^2 - 1)^3$  for all real numbers  $x$ . For what values of  $x$  is the function increasing?

a)  $(1, \infty)$ b)  $(0, \infty)$ c)  $[0, \infty)$ d)  $(-1, 1)$ e)  $(-1, 0]$ 

5. Let  $f(x) = x^2(x + 9)$ . Over what interval is the function decreasing?

a)  $0 < x < 6$ b)  $-6 < x < 0$ c)  $0 < x < \infty$ d)  $-\infty < x < \infty$ e)  $-\infty < x < -6$  and  $x > 0$

6. Determine the values of  $x$  for which the function  $f(x) = |x - 5|$  is decreasing.

- a)  $(-\infty, -5)$       b)  $(-\infty, 5)$       c)  $[-5, 0)$       d)  $(0, 5)$       e)  $(5, \infty)$

7. Given that  $f$  is continuous and the following information:

Intervals	$x < 4$	$4 < x < 9$	$9 < x$
Sign of $f'$	+	-	+

- a) For what  $x$ -coordinate(s) is there a local minimum?  
b) For what  $x$ -coordinate(s) is there a local maximum?

8. Let  $f(x) = x^2 + 5x$  on  $[0, 5]$

Which of the hypotheses of Rolle's Theorem are not satisfied on the given interval?

- I.  $f$  is differentiable in  $(a, b)$   
II.  $f$  is continuous at  $x = a$  and  $x = b$   
III.  $f(a) = f(b) = 0$   
IV. there is no  $c$  in  $(a, b)$  for which  $f'(c) = 0$

- a) III and IV      b) IV only      c) I and III      d) II and III      e) III only

9. Let  $f(x) = x^{\frac{3}{2}}$  on  $[0, 4]$

Which of the hypotheses of Rolle's Theorem are not satisfied on the given interval?

- I.  $f$  is differentiable in  $(a, b)$
- II.  $f$  is continuous at  $x = a$  and  $x = b$
- III.  $f(a) = f(b) = 0$
- IV. there is no  $c$  in  $(a, b)$  for which  $f'(c) = 0$

- a) III and IV      b) IV only      c) I and IV      d) II and III      e) III only

10. Given  $f(x) = 10 - \frac{16}{x}$ , find all  $c$  in the interval  $(2, 8)$  such that  $f'(c) = \frac{f(8) - f(2)}{8 - 2}$ .

- a) 4      b) 5      c)  $\frac{8}{5}$       d)  $\pm 4$       e) 7

11. Given that  $f'(x) = 2x \sin(2x)$  for  $0 < x < 4$  then  $f$  has a local maximum for  $x \approx$

- a) 3.990      b) 3.142      c) 1.820      d) 7.917      e) 1.571

12. If  $f(x) = \sqrt{x+2}$ , then which one of the following is equal to  $f'(x)$ ?

a)  $\lim_{h \rightarrow 0} \frac{\sqrt{x+h+2} - \sqrt{x+2}}{2}$

b)  $\lim_{h \rightarrow 0} \frac{\sqrt{x+h+2} - \sqrt{x+2}}{h}$

c)  $\lim_{h \rightarrow 0} \frac{\sqrt{x+h+2} - (x+2)}{h}$

d)  $\lim_{x \rightarrow 2} \frac{\sqrt{x+2} - \sqrt{h+2}}{h}$

e)  $\lim_{x \rightarrow 2} \frac{\sqrt{x+h+2} - \sqrt{h}}{h}$

13. What is  $\lim_{h \rightarrow 0} \frac{(x+h)^2 - x^2}{h}$ ?

a)  $2xh$

b)  $2x$

c)  $2h$

d)  $h$

e)  $0$

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

If  $A = \begin{pmatrix} 1 \\ g \end{pmatrix}$  then  $A'(4) =$

a)  $0$

b)  $\frac{4}{9}$

c)  $-\frac{4}{9}$

d)  $\frac{1}{4}$

e)  $-\frac{1}{4}$

$x$	$f$	$f'$	$g$	$g'$
0	5	1	-7	$\frac{1}{4}$
2	8	3	-5	1
4	14	9	-3	4
6	26	27	-1	16

15. Differentiate:  $s(t) = \sec \sqrt{t}$

a)  $\tan^2 \sqrt{t}$

b)  $\frac{\sec \sqrt{t} \cdot \tan \sqrt{t}}{2\sqrt{t}}$

c)  $\sec \frac{1}{2\sqrt{t}} \cdot \tan \frac{1}{2\sqrt{t}}$

d)  $\sec \sqrt{t} \cdot \tan \sqrt{t}$

e)  $\frac{\csc \sqrt{t}}{\sqrt{t}}$

16. Find the point on the curve  $f(x) = x^2 + 1$  that is nearest to the the point  $B(3, 1)$ .

a)  $(1, 2)$

b)  $(2, 5)$

c)  $(0, 1)$

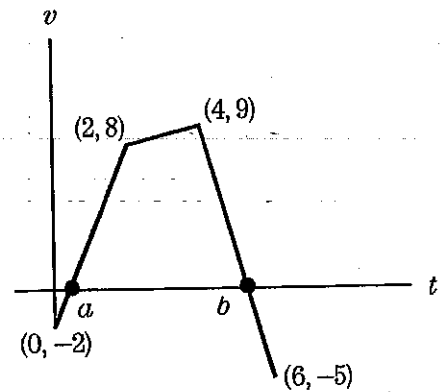
d)  $(\frac{1}{3}, \frac{2}{3})$

e)  $(5, 2)$

17. The graph shows the velocity of an object that is moving along a straight line for  $t$  on  $[0, 6]$ .

At what time(s)  $t$  does the object reverse direction?

- a) 2 and 4    b)  $a$  and  $b$     c) 4 only    d) 5 only    e)  $a$  only



18. Find the critical numbers of  $f(x) = x^3 - 12x^2$ .

- a) 0 and 8    b) 0, 8, 12    c) 3, 8    d) -8, 0, 3    e) 1 only

19. If  $f(x) = (4 - x^2)^{1/5}$ , find all critical numbers.

- a) -2, 0, 2    b) -2 and 2    c) 0 and 2    d) 0 only    e) 2 only

20. Find the relative minimum  $f(x) = \frac{-7}{(x^2 - 3)}$  on the interval  $[-1, 2]$ .

- a)  $(\sqrt{3}, 0)$     b)  $(0, \frac{7}{3})$     c)  $(-3, -\frac{7}{6})$     d)  $(-\frac{1}{3}, 7)$     e)  $(\frac{1}{3}, -7)$

21. Let  $f(x) = 1 + \cos x - (\sin x)^2$  for  $0 \leq x \leq \frac{3\pi}{2}$ . Find the absolute maximum of the function  $f$ .

a) 1

b) 2

c)  $-\frac{1}{4}$

d) 4

e) 1.5

22. Find the absolute maximum and absolute minimum of  $f$  on  $(1, 4]$ .

$$f(x) = \frac{x^3 - 7x^2 + 12x - 6}{x - 1}$$

a) Max: None, Min:  $(3, -3)$

b) Max:  $(1, 1)$ , Min:  $(4, -2)$

c) Max:  $(1, 1)$ , Min:  $(3, -3)$

d) Max: None, Min:  $(4, -2)$

e) Max: None, Min:  $(2, -2)$