AP Calculus
Calculator M.C. Review

1. If $f(x)=2x^2+4$, which of the following will calculate the derivative of $f(x)$?

a) $\dfrac{\left[2(x+\Delta x)^2+4\right]-(2x^2+4)}{\Delta x}$

b) $\lim\limits_{\Delta x\to 0}\dfrac{(2x^2+4+\Delta x)-(2x^2+4)}{\Delta x}$

c) $\lim\limits_{\Delta x\to 0}\dfrac{\left[2(x+\Delta x)^2+4\right]-(2x^2+4)}{\Delta x}$

d) $\dfrac{(2x^2+4+\Delta x)-(2x^2+4)}{\Delta x}$

e) None of these

2. Differentiate: $y=\dfrac{1+\cos x}{1-\cos x}$

a) -1 b) $-2\csc x$ c) $2\csc x$ d) $\dfrac{-2\sin x}{(1-\cos x)^2}$ e) None of these

3. Find dy/dx for $y=(x^3)\sqrt{x+1}$.

a) $\dfrac{3x^2}{2\sqrt{x+1}}$ b) $\dfrac{x^2(7x+6)}{2\sqrt{x+1}}$ c) $3x^2\sqrt{x+1}$ d) $\dfrac{7x^3+x^2}{2\sqrt{x+1}}$ e) None of these

4. Find $f'(x)$ for $f(x)=(2x^2+5)^7$.

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

5. A point moves along a curve $y=2x^2+1$ in such a way that the *y* value is decreasing at the rate of 2 units per second. At what rate is *x* changing when $x=\frac{3}{2}$?

a) increasing $\frac{1}{3}$ unit/sec b) decreasing $\frac{1}{3}$ unit/sec c) decreasing $\frac{7}{2}$ unit/sec

d) increasing $\frac{7}{2}$ unit/sec e) None of these

6. The position equation for the movement of a particle is given by $s=(t^2-1)^3$ when *s* is measured in feet and *t* is measured in seconds. Find the acceleration at two seconds.

a) 342 $\text{units}/\sec^2$ b) 18 $\text{units}/\sec^2$ c) 288 $\text{units}/\sec^2$
d) 90 $\text{units}/\sec^2$ e) None of these

7. Find $\frac{dy}{dx}$ if $y^2-3xy+x^2=7$
a) $\frac{2x+y}{3x-2y}$ b) $\frac{3y-2x}{2y-3x}$ c) $\frac{2x}{3-2y}$ d) $\frac{2x}{y}$ e) None of these

8. The position function for a particular object is $s=-\frac{35}{2}t^2+58t+91$. Which statement is true?
a) The initial velocity is -35. b) The velocity is constant.
c) The velocity at time t = 1 is 23. d) The initial position is $-\frac{35}{2}$. e) None of these

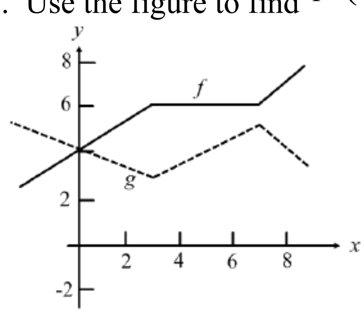
9. Differentiate: $y=\sec^2 x+\tan^2 x$.
a) 0 b) $\tan x+\sec^4 x$ c) $\sec^2 x\left(\sec^2 x+\tan^2 x\right)$
d) $4\sec^2 x\tan x$ e) None of these

10. Let $f(3)=0,\ f'(3)=6,\ g(3)=1 \text{ and } g'(3)=\frac{1}{3}$. Find $h'(3)$ if $h(x)=\frac{f(x)}{g(x)}$.
a) 18 b) 6 c) -6 d) -2 e) None of these

11. Find an equation for the tangent line to the graph of $f(x)=2x^2-2x+3$ at the point where x = 1.
a) $y=2x-2$ b) $y=4x^2-6x+5$ c) $y=2x+1$
d) $y=4x^2-6x+2$ e) None of these

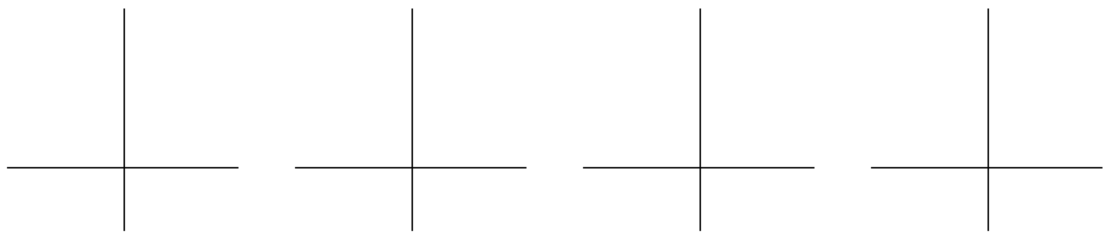
12. Find all points on the graph of $f(x)=-x^3+3x^2-2$ at which there is a horizontal tangent line.
a) (0, -2) and (2, 2) b) (0, -2) c) (1, 0) and (0, -2)
d) (2, 2) e) None of these

13. Let $p(x)=f(x)g(x)$. Use the figure to find $p'(5)$.
a) 7 b) 3
c) 0 d) 24
e) None of these



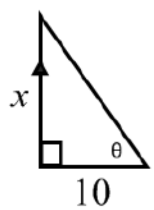
14. For how many of the functions below could the Mean Value Theorem be applied on $[a, b]$?

a) 0
b) 1
c) 2
d) 3
e) 4



15. Consider the following figure where the distance x is increasing at the rate of 50 units per second. In radians per second, what is the rate of change of the angle θ when $x = 10$?

a) 1
b) 1.25
c) 1.5
d) 2
e) 2.5



16. A function $y = f(x)$ has the properties $f'(a) = f''(a) = 0$. Which one of the following statements is true?

a) The graph of $y = f(x)$ has a horizontal tangent at $(a, f(a))$.
b) $(a, f(a))$ is a point of inflection.
c) $(a, f(a))$ must be either a maximum or a minimum point.
d) f may be discontinuous at x = a.
e) None of the above is necessarily true.

17. Given that $f(x) = |x-3| + 2$, which one of the following statements is false?

a) f is continuous at $x = 3$.
b) f is differentiable at $x = 3$.
c) $f'(5) = 1$
d) $f'(0) = -1$
e) $f(2) = f(4)$

18. If f is continuous on [-4, 4] such that $f(-4) = 11$ and $f(4) = -11$, then

a) $f(0)=0$

b) $\lim_{x\to 2} f(x)=8$

c) There is at least one c in [-4, 4] such that $f(c)=8$.

d) $\lim_{x\to 3} f(x)=\lim_{x\to -3} f(x)$

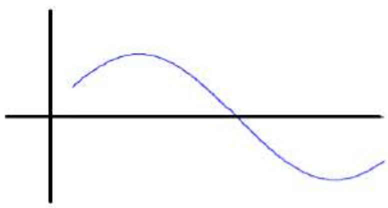
e) It is possible that f is not defined at $x = 0$

19. If $f(x)=\begin{cases} \dfrac{x^2-4}{x-2}, & \text{if } x\neq 2 \\ k, & \text{if } x=2 \end{cases}$, for what values(s) of k is f continuous at $x = 2$?

a) -2, and 2 b) 4 c) 8 d) 0 e) 6

20. The following graph represents the function $y=f(x)$. For which of the five domain values shown is $f''(x)>0$ and $f'(x)<0$?

a) a
b) b
c) c
d) d
e) e

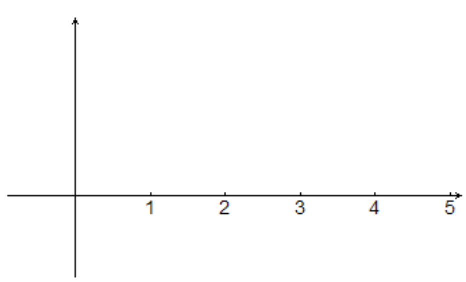


21. Given L feet of fencing, what is the maximum number of square feet that can be enclosed if the fencing is used to make three sides of a rectangular pen, using an existing wall as the fourth side?

a) $L^2/4$ b) $L^2/8$ c) $L^2/9$ d) $L^2/16$ e) $2L^2/9$

22. Using the graph below of f', f has a local maximum at $x =$

a) 0 only
b) 4 only
c) 0 and 4
d) 0 and 5
e) 0, 4, and 5



23. Using the graph above of f', f has a point of inflection at x =

a) 2 only b) 3 only c) 4 only d) 2 and 3 e) 2, 3, and 4

24. If y is a differentiable function of x, then the slope of the curve of $xy^2 - 2y + 4y^3 = 6$ at the point where $y = 1$ is

a) $-\frac{1}{18}$ b) $-\frac{1}{26}$ c) $\frac{5}{18}$ d) $-\frac{11}{18}$ e) 2

25. If $f(x) = \cos x \sin 3x$, then $f'\left(\frac{\pi}{6}\right)$ is equal to

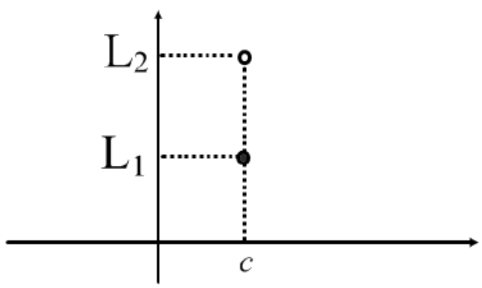
a) $\frac{1}{2}$ b) $-\frac{\sqrt{3}}{2}$ c) 0 d) 1 e) $-\frac{1}{2}$

26. If $f(3) = 8$ and $f'(3) = -4$, then $f(3.02)$ is approximately

a) -8.08 b) 7.92 c) 7.98 d) 8.02 e) 8.08

27. Find $\lim_{x \to c} f(x)$ using the graph below.

a) L_1
b) L_2
c) $\frac{L_1 + L_2}{2}$
d) $L_1 + L_2$
e) undefined



28. If f is continuous on [4, 7], how many of the following statements must be true?

i. f has a maximum value on [4, 7].
ii. f has a minimum value on [4, 7].
iii. $f(7) > f(4)$.
iv. $\lim_{x \to 6} f(x) = f(6)$.

a) 0 b) 1 c) 2 d) 3 e) 4

29. Given that f is a function, how many of the following statements are true?

i. If f is continuous at $x = c$, then $f'(c)$ exists.
ii. If $f'(c)$ exists, then f is continuous at $x = c$.
iii. $\lim_{x \to c} f(x) = f(c)$.
iv. If f is continuous on (a, b), then f is continuous on $[a, b]$.

a) 0 b) 1 c) 2 d) 3 e) 4

30. If $w(x) = x^7 + 4x^5 - 7$ and $z(t) = t^2$, then $w(z(c)) =$

a) $(c^7 + 4c^5 - 7)^2$
b) $c^7 + 4c^5 - 7$
c) c^2
d) $c^{14} + 4c^{10} - 7c^2$
e) $c^{14} + 4c^{10} - 7$

31. Given that f is a function, how many of the following statements are true?

i. If $f''(a) < 0$, then the graph of $y = f(x)$ is concave upward at $x = a$.
ii. If $f'(a)$ does not exists, then a is not in the domain of f.
iii. If $f'(a) = 0$ and $f''(a) > 0$, then $f(a)$ is a relative maximum value.
iv. If $f'(a) = f''(a) = 0$, then $f'''(a) = 0$.

a) 0 b) 1 c) 2 d) 3 e) 4

32. If the surface area of a sphere is increasing at the rate of 12 sq. ft. per second, how fast, in terms of ft. per second, is the radius increasing when it is 2 ft?

a) 1 b) $\frac{1}{\pi}$ c) π d) $\frac{2}{\pi}$ e) $\frac{3}{4\pi}$

33. One leg of a right triangle begins to increase at the rate of 2 inches per minute while the other leg remains at 8 inches. In terms of in./min., how fast is the hypotenuse increasing when the first leg is 6 inches?

a) 2 b) 3 c) 6/5 d) 11/5 e) 4/3

34. $\lim_{x\to 1}\left(\frac{x^5-1}{x^2-x}\right)=$

a) 5 b) 5/2 c) 0 d) 1 e) limit does not exist

35. $\lim_{t\to 0}\frac{\sin t}{t}=$

a) 0 b) 1 c) $\pi/2$ d) -1 e) limit does not exist