AP Calc Review: Unit 3 Differentiation Application MC WS

1. The slope of the curve $y^3 - xy^2 = 4$ at the point where $y = 2$ is

(A) -2 (B) $\frac{1}{4}$ (C) $-\frac{1}{2}$ (D) $\frac{1}{2}$ (E) 2

2. The tangent to the curve $y^2 - xy + 9 = 0$ is vertical when

(A) $y = 0$ (B) $y = \pm\sqrt{3}$ (C) $y = \frac{1}{2}$

(D) $y = \pm 3$ (E) none of these

3. The function $f(x) = x^4 - 4x^2$ has

(A) one relative minimum and two relative maxima
(B) one relative minimum and one relative maximum
(C) two relative maxima and no relative minimum
(D) two relative minima and no relative maximum
(E) two relative minima and one relative maximum

4. The number of inflection points of the curve in Question 12 is

(A) 0 (B) 1 (C) 2 (D) 3 (E) 4

5. The maximum value of the function $y = -4\sqrt{2 - x}$ is

(A) 0 (B) -4 (C) 2 (D) -2 (E) none of these

6. A balloon is being filled with helium at the rate of 4 ft^3/min. The rate, in square feet per minute, at which the surface area is increasing when the volume is $\frac{32\pi}{3}$ ft^3 is

(A) 4π (B) 2 (C) 4 (D) 1 (E) 2π

7. A circular conical reservoir, vertex down, has depth 20 ft and radius of the top 10 ft. Water is leaking out so that the surface is falling at the rate of $\frac{1}{2}$ ft/hr. The rate, in cubic feet per hour, at which the water is leaving the reservoir when the water is 8 ft deep is

(A) 4π (B) 8π (C) 16π (D) $\frac{1}{4\pi}$ (E) $\frac{1}{8\pi}$

8.

Two cars are traveling along perpendicular roads, car *A* at 40 mph, car *B* at 60 mph. At noon, when car *A* reaches the intersection, car *B* is 90 mi away, and moving toward it. At 1 P.M. the rate, in miles per hour, at which the distance between the cars is changing is

(A) –40 (B) 68 (C) 4 (D) –4 (E) 40

9. If $f(x) = ax^4 + bx^2$ and $ab > 0$, then

(A) the curve has no horizontal tangents
(B) the curve is concave up for all x
(C) the curve is concave down for all x
(D) the curve has no inflection point
(E) none of the preceding is necessarily true

10. A function f is continuous and differentiable on the interval [0,4], where f' is positive but f'' is negative. Which table could represent points on f?

(A)

x	0	1	2	3	4
y	10	12	14	16	18

(B)

x	0	1	2	3	4
y	10	12	15	19	24

(C)

x	0	1	2	3	4
y	10	18	24	28	30

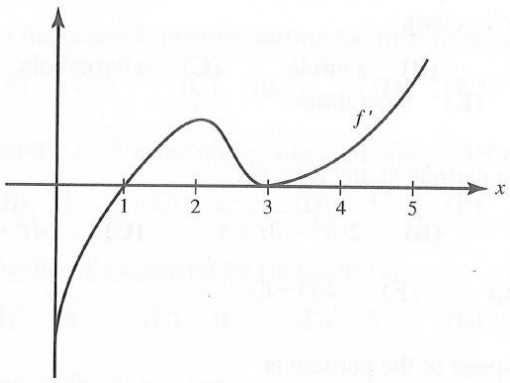
(D)

x	0	1	2	3	4
y	30	28	24	18	10

(E)

x	0	1	2	3	4
y	24	19	15	12	10

Use the graph of f' on [0,5], shown below, for Questions **11 and 12**



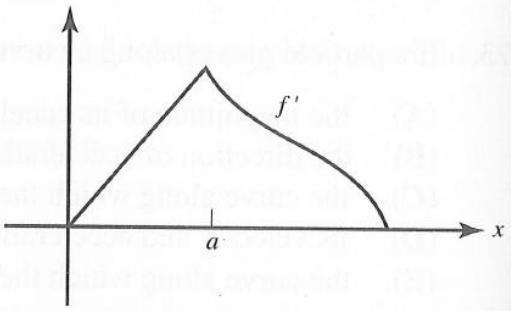
11. f has a local minimum at $x =$

(A) 0 (B) 1 (C) 2 (D) 3 (E) 5

12. The graph of f has a point of inflection at $x =$

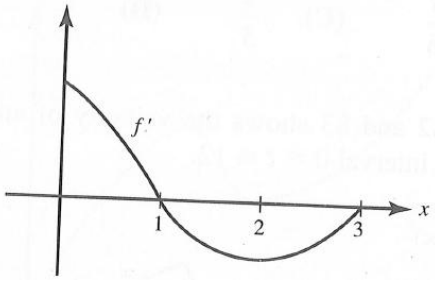
(A) 1 only (B) 2 only (C) 3 only
(D) 2 and 3 only (E) none of these

13. It follows from the graph of f', shown at the right, that

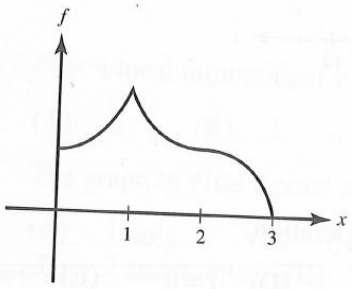


(A) f is not continuous at $x = a$
(B) f is continuous but not differentiable at $x = a$
(C) f has a relative maximum at $x = a$
(D) The graph of f has a point of inflection at $x = a$
(E) none of these

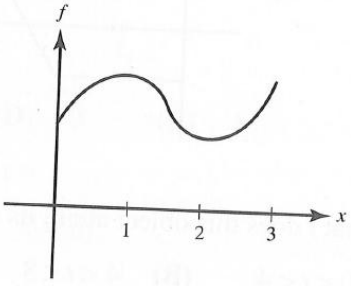
14. Given f' as graphed, which could be the graph of f?



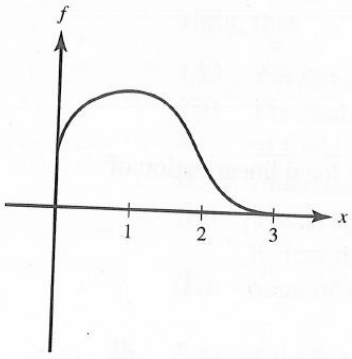
(A)



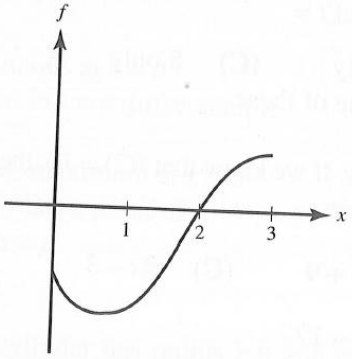
(B)



(C)



(D)



(E)