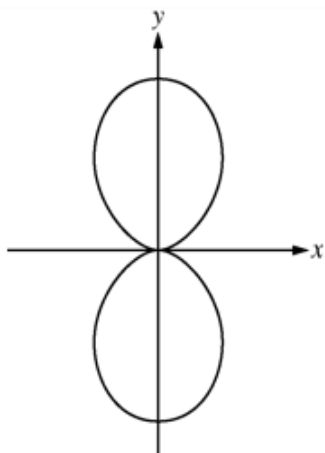


APCalcBC-HomeworkQuiz-#4

1.



Which of the following expressions gives the total area enclosed by the polar curve $r = \sin^2\theta$ shown in the figure above?

(A) $\frac{1}{2} \int_0^\pi \sin^2\theta \, d\theta$

(B) $\int_0^\pi \sin^2\theta \, d\theta$

(C) $\frac{1}{2} \int_0^\pi \sin^4\theta \, d\theta$

(D) $\int_0^\pi \sin^4\theta \, d\theta$

(E) $2 \int_0^\pi \sin^4\theta \, d\theta$

2.

Using the substitution $u = \sqrt{x}$, $\int_1^4 \frac{e^{\sqrt{x}}}{\sqrt{x}} dx$ is equal to which of the following?

(A) $2 \int_1^{16} e^u du$

(B) $2 \int_1^4 e^u du$

(C) $2 \int_1^2 e^u du$

(D) $\frac{1}{2} \int_1^2 e^u du$

(E) $\int_1^4 e^u du$

3. If $dy/dx = \tan x$, then $y =$

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- (A) $12 \tan^2 x + C$
- (B) $\sec^2 x + C$
- (C) $\ln |\sec x| + C$
- (D) $\ln |\cos x| + C$
- (E) $\sec x \tan x + C$

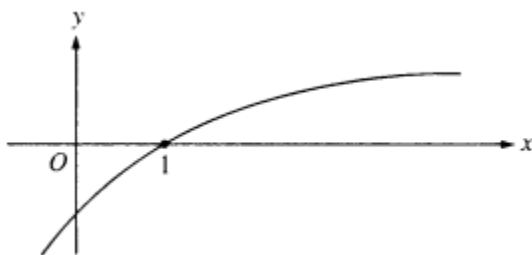
4. $\int_0^{\frac{\pi}{3}} \sin(3x) \, dx =$

- (A) -2
- (B) -2/3
- (C) 0
- (D) 2/3
- (E) 2

5. The maximum acceleration attained on the interval $0 \leq t \leq 3$ by the particle whose velocity is given by $v(t) = t^3 - 3t^2 + 12t + 4$ is

- (A) 9
- (B) 12
- (C) 14
- (D) 21
- (E) 40

6.



The graph of a twice-differentiable function f is shown in the figure above. Which of the following is true?

- (A) $f(1) < f'(1) < f''(1)$
- (B) $f(1) < f''(1) < f'(1)$
- (C) $f'(1) < f(1) < f''(1)$
- (D) $f''(1) < f(1) < f'(1)$
- (E) $f''(1) < f'(1) < f(1)$

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7.

X	-2	0	3	5	6
$f'(x)$	3	1	4	7	5

Let f be a polynomial function with values of $f'(x)$ at selected values of x given in the table above. Which of the following must be true for $-2 < x < 6$?

- (A) The graph of f is concave up.
(B) The graph of f has at least two points of inflection.
(C) f is increasing.
(D) f has no critical points.
(E) f has at least two relative extrema.
8. Let f be the function given by $f(x) = 2xe^x$. The graph of f is concave down when
- (A) $x < -2$
(B) $x > -2$
(C) $x < -1$
(D) $x > -1$
(E) $x < 0$
9. What are all values of x for which the series $\sum_{n=1}^{\infty} \frac{(x-2)^n}{n \cdot 3^n}$ converges?
- (A) $-3 \leq x \leq 3$
(B) $-3 < x < 3$
(C) $-1 < x \leq 5$
(D) $-1 \leq x \leq 5$
(E) $-1 \leq x < 5$
10. What is the x -coordinate of the point of inflection on the graph of $y = \frac{1}{3}x^3 + 5x^2 + 24$?
- (A) 5
(B) 0
(C) $-\frac{10}{3}$
(D) -5
(E) -10
11. The point on the curve $x^2 + 2y = 0$ that is nearest the point $(0, -1/2)$ occurs where y is

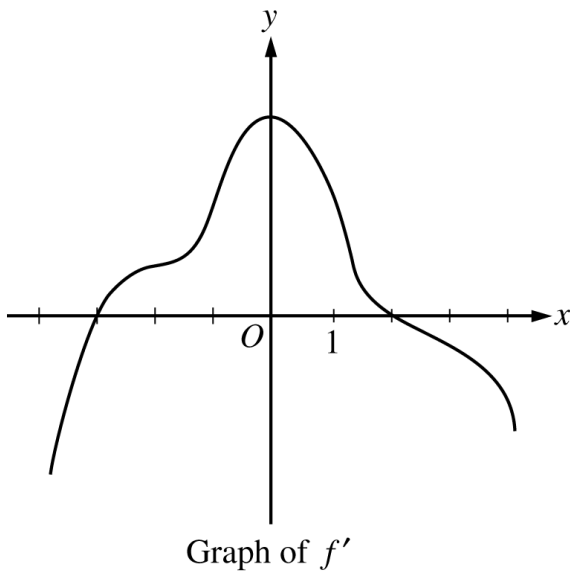
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- (A) $1/2$
- (B) 0
- (C) $-1/2$
- (D) -1
- (E) none of the above

12. A curve C is defined by the parametric equations $x = t^2 - 4t + 1$ and $y = t^3$. Which of the following is an equation of the line tangent to the graph of C at the point $(-3, 8)$?

- (A) $x = -3$
- (B) $x = 2$
- (C) $y = 8$
- (D) $y = -\frac{27}{10}(x + 3) + 8$
- (E) $y = 12(x + 3) + 8$

13.



Graph of f'

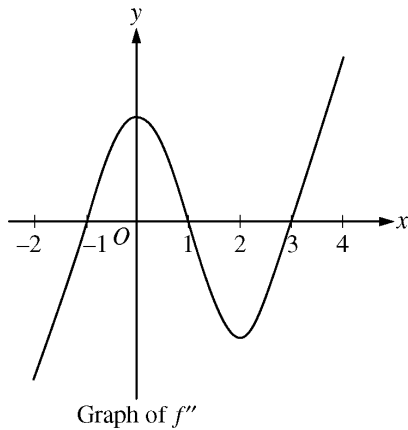
The graph of f' , the derivative of the function f , is shown above. Which of the following statements must be true?

- I. f has a relative minimum at $x = -3$.
- II. The graph of f has a point of inflection at $x = -2$.
- III. The graph of f is concave down for $0 < x < 4$.


- (A) I only
- (B) II only
- (C) III only
- (D) I and II only
- (E) I and III only

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14.

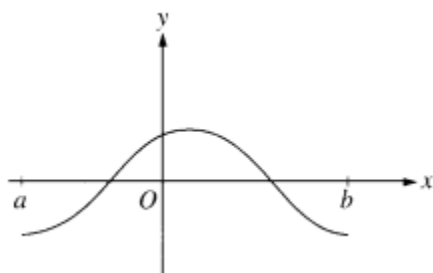


The graph of f'' , the second derivative of f , is shown above for $-2 \leq x \leq 4$. What are all intervals on which the graph of the function f is concave down?

- (A) $-1 < x < 1$
(B) $0 < x < 2$
(C) $1 < x < 3$ only
(D) $-2 < x < -1$ only
(E) $-2 < x < -1$ and $1 < x < 3$
15. If $a \neq 0$, then $\lim_{x \rightarrow a} \frac{x^2 - a^2}{x^4 - a^4}$ is
- (A) $\frac{1}{a^2}$
(B) $\frac{1}{2a^2}$
(C) $\frac{1}{6a^2}$
(D) 0
(E) nonexistent
16.  If $x = t^2 + 1$ and $y = t^3$, then $d^2y/dx^2 =$
- (A) $3/4t$
(B) $3/2t$
(C) $3t$
(D) $6t$
(E) $3/2$

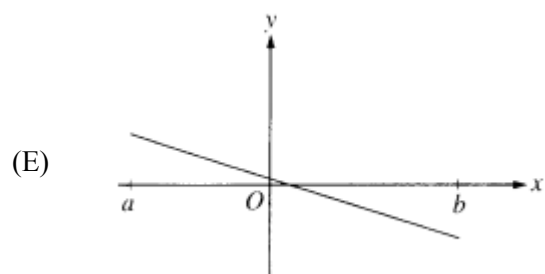
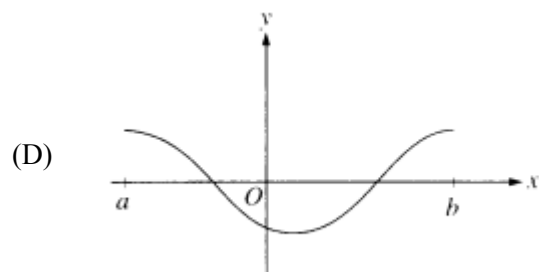
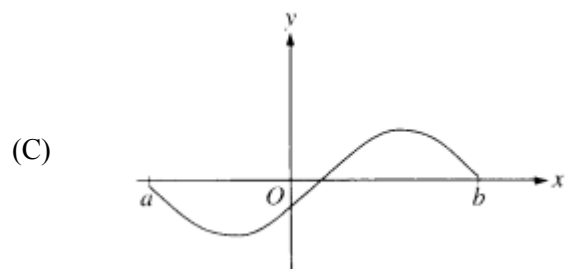
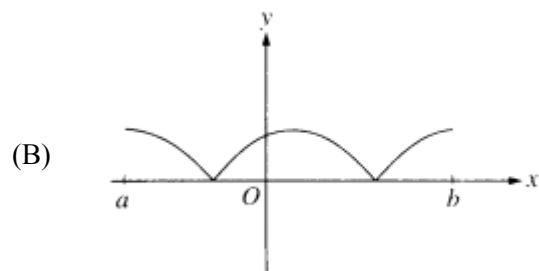
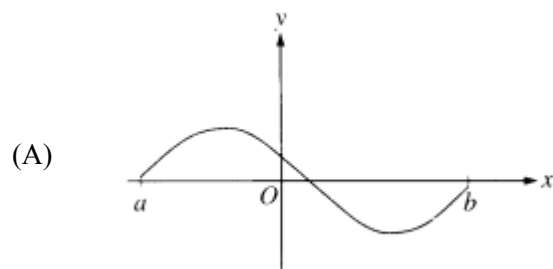
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17.



The graph of f is shown in the figure above. Which of the following could be the graph of derivative of f ?

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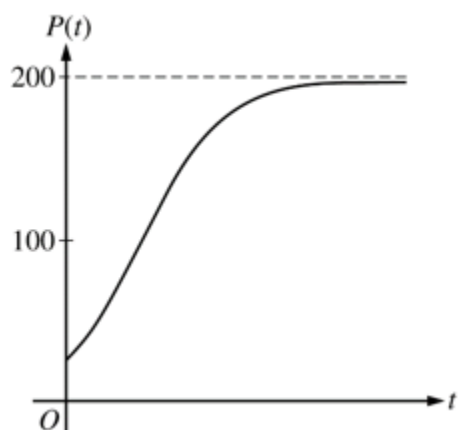
18. For what values of t does the curve given by the parametric equations $x = t^3 - t^2 - 1$ and $y = t^4 + 2t^2 - 8t$ have a vertical tangent?

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- (A) 0 only
(B) 1 only
(C) 0 and $\frac{2}{3}$ only
(D) 0, $\frac{2}{3}$, and 1
(E) No value
19. The sum of the infinite geometric series $\frac{3}{2} + \frac{9}{16} + \frac{27}{128} + \frac{81}{1,024} + \dots$ is
(A) 1.60
(B) 2.35
(C) 2.40
(D) 2.45
(E) 2.50
20. For $x \geq 0$, the horizontal line $y = 2$ is an asymptote for the graph of the function f . Which of the following statements must be true?
(A) $f(0) = 2$
(B) $f(x) \neq 2$ for all $x \geq 0$
(C) $f(2)$ is undefined.
(D) $\lim_{x \rightarrow 2} f(x) = \infty$
(E) $\lim_{x \rightarrow \infty} f(x) = 2$
21. Which of the following is the solution to the differential equation $\frac{dy}{dx} = 2 \sin x$ with the initial condition $y(\pi) = 1$?
(A) $y = 2 \cos x + 3$
(B) $y = 2 \cos x - 1$
(C) $y = -2 \cos x + 3$
(D) $y = -2 \cos x + 1$
(E) $y = -2 \cos x - 1$

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22.



Which of the following differential equations for a population P could model the logistic growth shown in the figure above?


- (A) $\frac{dP}{dt} = 0.2P - 0.001P^2$
- (B) $\frac{dP}{dt} = 0.1P - 0.001P^2$
- (C) $\frac{dP}{dt} = 0.2P^2 - 0.001P$
- (D) $\frac{dP}{dt} = 0.1P^2 - 0.001P$
- (E) $\frac{dP}{dt} = 0.1P^2 + 0.001P$

23.

What is the value of $\sum_{n=1}^{\infty} \frac{2^{n+1}}{3^n}$?

- (A) 1
- (B) 2
- (C) 4
- (D) 6
- (E) The series diverges.

24.

 The velocity, in ft/sec, of a particle moving along the x -axis is given by the function $v(t) = e^t + te^t$. What is the average velocity of the particle from time $t = 0$ to time $t = 3$?

- (A) 20.086 ft/sec
- (B) 26.447 ft/sec
- (C) 32.809 ft/sec
- (D) 40.671 ft/sec
- (E) 79.342 ft/sec

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25. $f(x) = \begin{cases} x^2 - 3x + 9 & \text{for } x \leq 2 \\ kx + 1 & \text{for } x > 2 \end{cases}$

The function f is defined above. For what value of k , if any, is f continuous at $x = 2$?

- (A) 1
- (B) 2
- (C) 3
- (D) 7
- (E) No value of k will make f continuous at $x = 2$.