

Review 13, Calculator Permitted

Complete all the following on notebook paper.

_____ 1.

A particle moves along the x -axis so that its position at time t is given by $x(t) = t^2 - 6t + 5$. For what value of t is the velocity of the particle zero?

- (A) 1 (B) 2 (C) 3 (D) 4 (E) 5

_____ 2.

If $F(x) = \int_0^x \sqrt{t^3 + 1} dt$, then $F'(2) =$

- (A) -3 (B) -2 (C) 2 (D) 3 (E) 18

_____ 3.

If $f(x) = \sin(e^{-x})$, then $f'(x) =$

- (A) $-\cos(e^{-x})$
(B) $\cos(e^{-x}) + e^{-x}$
(C) $\cos(e^{-x}) - e^{-x}$
(D) $e^{-x} \cos(e^{-x})$
(E) $-e^{-x} \cos(e^{-x})$

_____ 4.

An equation of the line tangent to the graph of $y = x + \cos x$ at the point $(0,1)$ is

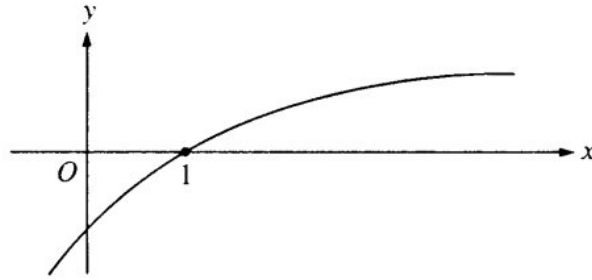
- (A) $y = 2x + 1$ (B) $y = x + 1$ (C) $y = x$ (D) $y = x - 1$ (E) $y = 0$

_____ 5.

If $f''(x) = x(x+1)(x-2)^2$, then the graph of f has inflection points when $x =$

- (A) -1 only (B) 2 only (C) -1 and 0 only (D) -1 and 2 only (E) -1, 0, and 2 only

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) $f''(1) < f'(1) < f(1)$

7.

If $\frac{dy}{dt} = ky$ and k is a nonzero constant, then y could be

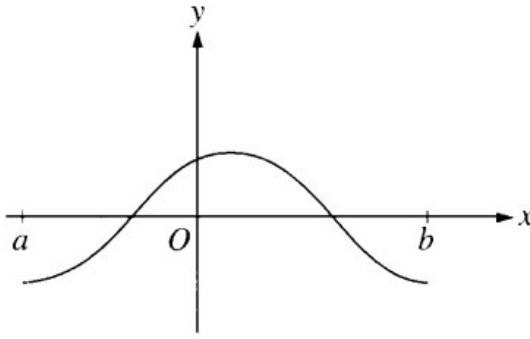
- (A) $2e^{kty}$
- (B) $2e^{kt}$
- (C) $e^{kt} + 3$
- (D) $kty + 5$
- (E) $\frac{1}{2}ky^2 + \frac{1}{2}$

8.

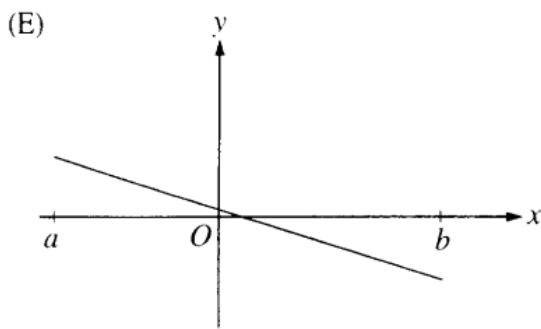
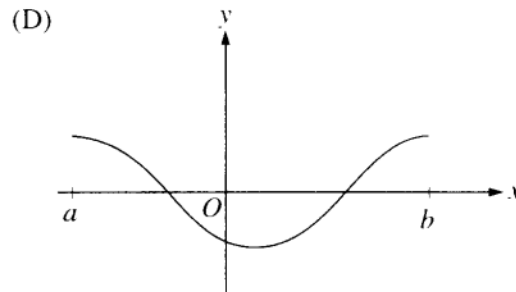
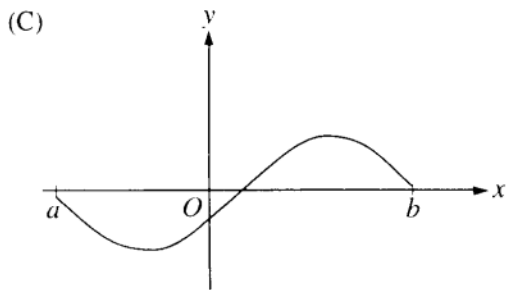
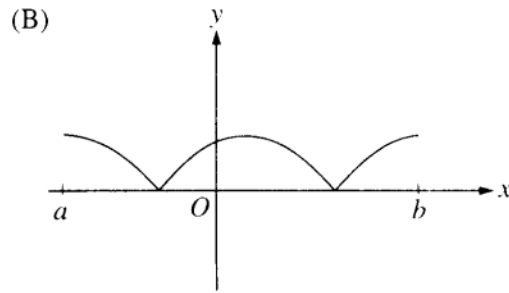
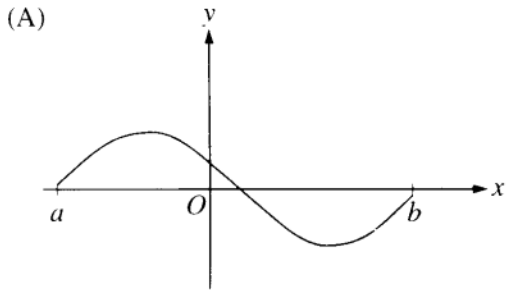
The function f is given by $f(x) = x^4 + x^2 - 2$. On which of the following intervals is f increasing?

- (A) $\left(-\frac{1}{\sqrt{2}}, \infty\right)$
- (B) $\left(-\frac{1}{\sqrt{2}}, \frac{1}{\sqrt{2}}\right)$
- (C) $(0, \infty)$
- (D) $(-\infty, 0)$
- (E) $\left(-\infty, -\frac{1}{\sqrt{2}}\right)$

9.



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



10.

If $f(x) = \begin{cases} \ln x & \text{for } 0 < x \leq 2 \\ x^2 \ln 2 & \text{for } 2 < x \leq 4, \end{cases}$ then $\lim_{x \rightarrow 2} f(x)$ is

- (A) $\ln 2$ (B) $\ln 8$ (C) $\ln 16$ (D) 4 (E) nonexistent

11. 2008-AB1B

Let R be the region in the first quadrant bounded by the graphs of $y = \sqrt{x}$ and $y = \frac{x}{3}$.

- (a) Find the area of R .
- (b) Find the volume of the solid generated when R is rotated about the vertical line $x = -1$.
- (c) The region R is the base of a solid. For this solid, the cross sections perpendicular to the y -axis are squares. Find the volume of this solid.

12. 2008-AB2B

For time $t \geq 0$ hours, let $r(t) = 120(1 - e^{-10t^2})$ represent the speed, in kilometers per hour, at which a car travels along a straight road. The number of liters of gasoline used by the car to travel x kilometers is modeled by $g(x) = 0.05x(1 - e^{-x/2})$.

- (a) How many kilometers does the car travel during the first 2 hours?
- (b) Find the rate of change with respect to time of the number of liters of gasoline used by the car when $t = 2$ hours. Indicate units of measure.
- (c) How many liters of gasoline have been used by the car when it reaches a speed of 80 kilometers per hour?