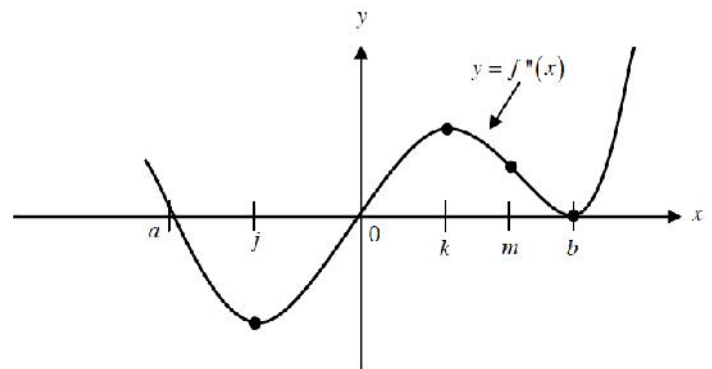


AP Calculus AB/BC

TEST: 3.1 to 3.8, **Calculator OK**

- _____ 1. How many values of c satisfy the Mean Value Theorem for the equation $f(x) = x \cos(\sqrt{x})$, $0 \leq x \leq 50$?
 (A) 0 (B) 1 (C) 2 (D) 3 (E) 4
- _____ 2. The function f is twice differentiable with $f(2) = 1$, $f'(2) = 4$, and $f''(2) = 3$. What is the value of the approximation of $f(1.9)$ using the line tangent to the graph of f at $x = 2$?
 (A) 0.4 (B) 0.6 (C) 0.7 (D) 1.3 (E) 1.4
- _____ 3. A rectangle has one side on the x -axis and the upper two vertices on the graph of $y = e^{-2x^2}$. Give a decimal approximation for the maximum possible area for this rectangle.
 (A) 1.649 (B) 1 (C) 2.031 (D) 0.545 (E) 0.606
- _____ 4. 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) $x < 0$
- _____ 5. The radius of a sphere is decreasing at a rate of 2 centimeters per second. At the instant when the radius of the sphere is 3 centimeters, what is the rate of change, in square centimeters per second, of the surface area of the sphere?
 (A) $-108f$ (B) $-72f$ (C) $-48f$ (D) $-24f$ (E) $-16f$
- _____ 6. Let f be the function with derivative given by $f'(x) = \sin(x^2 + 1)$. How many relative extrema does f have on the interval $2 < x < 4$?
 (A) One (B) Two (C) Three (D) Four (E) Five

- _____ 7. The second derivative of a function f is given by $f''(x) = x(x-a)(x-b)^2$. The graph of f'' is shown at right. For what values of x does the graph of f have a point of inflection?



- (A) 0 and a only (B) 0 and m only
 (C) j and b only (D) 0, a , and b (E) j , b , and k

- _____ 8. If $f(x) = 3x^2 + x$, $x = 2$, and $dx = 0.002$, find dy .
 (A) 0.02 (B) 0.026 (C) 0.028 (D) 0.014 (E) 0.26

Part II: Free Response. Do all work below the line. Label each part. Notation, Notation, Notation.

10. (1984-AB5) The volume V of a cone is increasing at the rate of $28f$ cubic inches per second. At the instant when the radius r on the cone is 3 inches, its volume is $12f$ cubic inches, and the radius is increasing at $\frac{1}{2}$ inches per second.
- (a) At the instant when the radius of the cone is 3 inches, what is the rate of change of the area of the base?
 - (b) At the instant when the radius of the cone is 3 inches, what is the rate of change of its height h ?
 - (c) At the instant when the radius of the cone is 3 inches, what is the instantaneous rate of change of the area of its base with respect to its height h ?
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1973 AB 6

A manufacturer finds it costs him $x^2 + 5x + 7$ dollars to produce x tons of an item. At production levels above 3 tons, he must hire additional workers, and his costs increase by $3(x - 3)$ dollars on his total production. If the price he receives is \$13 per ton regardless of how much he manufactures and if he has a plant capacity of 10 tons, what level of output maximizes his profits?

1976 AB 4

- A point moves on the hyperbola $3x^2 - y^2 = 23$ so that its y -coordinate is increasing at a constant rate of 4 units per second. How fast is the x -coordinate changing when $x = 4$?
- For what values of k will the line $2x + 9y + k = 0$ be normal to the hyperbola $3x^2 - y^2 = 23$?

1982 AB 4

A ladder 15 feet long is leaning against a building so that the end X is on level ground and end Y is on the wall. X is moved away from the building at the constant rate of $\frac{1}{2}$ foot per second.

- Find the rate in feet per second at which the length OY is changing when X is 9 feet from the building.
- Find the rate of change in square feet per second of the area of the triangle XOY when X is 9 feet from the building.