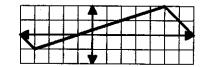
to y = ln(x) at x = 5.

- 1. A spherical balloon is being inflated at a rate of 4 ft³/s. How fast in ft/s is the radius increasing when the radius is 2 ft?
- 2. $f'(x) = (\ln x)(\sin 3x)$ over [0,3]. To the nearest thousandth give the interval(s) where f is concave up.
- 3. Give the letter of the functions that are differentiable at x = 0. A) $f(x) = \sin |x^2|$

B)
$$f(x) = Arctan|X|$$
 C) $f(x) = e^{x^2}$ D) $f(x) = \sqrt{x^2 + 0.1} - 0.1$ E) $f(x) = tan|X|$

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4. $f(1) = 4$, $g(1) = 1$, $f'(1) = -2$, and $g'(1) = 3$. Find $\frac{d}{dx} \left[\frac{f(x) - g(x)}{f(x)} \right]$ at $x = 1$.

- 5. List the letters of the statements that are true.
- A) $\lim_{h \to 0} \frac{\cot(x+h) \cot(x)}{h} = \csc^2(x)$ B) If the acceleration is positive, then the velocity is increasing. C) The domain of $\ln(x^2-4)$ is $|x| \ge 2$. D) Average speed over an interval is found by dividing displacement by the elapsed time. E) If $f'(x) = x(x+3)^2(x-2)$, then f has three relative extrema. F) The graph of the line through (-2,4) and (3,5) is parallel to the tangent line
- 6. Find the exact area of the largest rectangle that can be formed with lower base on the x-axis and upper vertices on the parabola $y = 14 - 2x^2$.
- 7. The graph of f'(x) is given. Each tick mark represents a unit of 1. If it is known that f(2) = 3, use the linearization of f at x = 2 to estimate f(2.03).



- 8. Let A be the number of values over [-2,3] that satisfy the conclusion of the Mean Value Theorem for
- $f(x) = x^3 5x + 2$. Let B be the number of relative maximum points that f has over [0, 4π] if $f'(x) = \frac{x}{15} + \sin(e^{0.2x})$. Let C be the number of points of inflection that
- $f''(x) = 0.5 + \cos(x) e^{-x}$ has over [0, 20]. Find A + B + C.
- 9. Let $f(x) = x^3 7x^2 + 25x 39$. Let g be the inverse function of f. What is the value of g'(0)?
- 10. Locate the midpoint between the coordinates of the relative maximum and minimum of on the graph of $y = x^3 + 2x^2 + x - 4$.
- 11. The rate of consumption of oil in the United States during the 1980's (in billions of barrels per year) is modeled by the function $C = 27.08e^{t/25}$, where t is the number of years after January 1, 1980. Find the total consumption of oil in the United States from January 1, 1982 to January 1, 1985 to the nearest billion.
- 12. The area of an equilateral triangle is increasing at a rate of 24 in²/min. Find the rate of change of the perimeter when the side of the triangle has length of 6 in.
- 13. If $0 \le k \le \frac{\pi}{2}$ and the area under the curve $y = \cos(x)$ from x = k to $x = \frac{\pi}{2}$ is 0.2, then k = ?
- 14. The position function s of a point moving rectilinearly is given by the equation
- $s(t) = 2t^3 15t^2 + 48t 10$. Find the acceleration when the velocity is first 12 m/sec.
- 15. Find the area of the region enclosed by the graphs of $y = 3x^2 5x + 5$ and $y = 4 x^2$