Name: _____

Take Home Quiz Ch. 3

Part A: No calculator!!

1. If $x^2 - y^2 = 5$, what is the value of $\dfrac{d^2 y}{dx^2}$ at the point (3, 2)?

(A) $-\dfrac{13}{8}$ (B) $-\dfrac{11}{8}$ (C) $-\dfrac{7}{8}$ (D) $-\dfrac{5}{8}$ (E) $-\dfrac{1}{4}$

2. $\lim\limits_{x \to 2} \dfrac{e^{2x} - e^4}{x - 2} =$

(A) e (B) $2e$ (C) $2e^2$ (D) e^4 (E) $2e^4$

3. What is an equation for the line tangent to $y = \tan^{-1} x$ at $x = \sqrt{3}$?

(A) $y - \dfrac{\pi}{3} = -\dfrac{1}{2}(x - \sqrt{3})$ (B) $y - \dfrac{\pi}{6} = -\dfrac{1}{4}(x - \sqrt{3})$ (C) $y - \dfrac{\pi}{3} = -\dfrac{1}{4}(x - \sqrt{3})$

(D) $y - \dfrac{\pi}{6} = \dfrac{3}{4}(x - \sqrt{3})$ (E) $y - \dfrac{\pi}{3} = \dfrac{1}{4}(x - \sqrt{3})$

4. For what point on the graph of $y = xe^{-2x}$ is the tangent line horizontal?

(A) $(-1, -e^2)$ (B) $\left(-\dfrac{1}{2}, -\dfrac{e}{2}\right)$ (C) $\left(\dfrac{1}{2}, 0\right)$

(D) $\left(\dfrac{1}{2}, \dfrac{1}{2e}\right)$ (E) $\left(1, \dfrac{1}{e^2}\right)$

5. If $x + \sin y = \ln y$, then $\dfrac{dy}{dx} =$

(A) $y + y\cos y$ (B) $\dfrac{y + \cos y - 1}{y}$ (C) $\dfrac{1 - y}{y\cos y}$

(D) $\dfrac{y}{y\cos y - 1}$ (E) $\dfrac{y}{1 - y\cos y}$

6. The radius of a sphere is increasing at a rate of 2 inches per minute. At what rate (in cubic inches per minute) is the volume increasing when the surface area of the sphere is 9π square inches?

(A) 2 (B) 2π (C) 9π (D) 18 (E) 18π

7. A differentiable function f has the property that $f(5) = 3$ and $f'(5) = 4$. What is the estimate for $f(4.8)$ using the local linear approximation for f at $x = 5$?

    (A) 2.2   (B) 2.8   (C) 3.4   (D) 3.8   (E) 4.6

8. The functions f and g are differentiable, and $f(g(x)) = x$ for all x. If $f(3) = 8$ and $f'(3) = 9$ what are the values of $g(8)$ and $g'(8)$

    (A) $g(8) = \dfrac{1}{3}$ and $g'(8) = -\dfrac{1}{9}$

    (B) $g(8) = \dfrac{1}{3}$ and $g'(8) = \dfrac{1}{9}$

    (C) $g(8) = 3$ and $g'(8) = -9$

    (D) $g(8) = 3$ and $g'(8) = -\dfrac{1}{9}$

    (E) $g(8) = 3$ and $g'(8) = \dfrac{1}{9}$

9. Let f be a function given by $f(x) = x^2 e^{-x}$. For what value of x is the slope of the line tangent to the graph of f at $(x, f(x))$ equal to 0.2?

    (A) -0.091   (B) 0.112   (C) 0.605   (D) 1.418   (E) 4.708

10. The height of a rectangular box is 10 in. Its length increases at the rate of 2 in./sec; its width decreases at the rate of 4 in./sec. When the length is 8 in. and the width is 6 in., the rate, in cubic inches per second, at which the volume of the box is changing is

    (A) 200   (B) 80   (C) -80   (D) -200   (E) -20

11. Car A is traveling south at 40 mph toward Millville, and Car B is traveling west at 30 mph toward Millville. If both cars began traveling 100 miles outside of Millville at the same time, then at what rate, mph, is the distance between them decreasing after 90 minutes?

    (A) 35.00   (B) 47.79   (C) 50.00   (D) 55.14   (E) 68.01