Math 75 - Sample Questions for Midterm II - Solutions

1. If $f(x) = \tan x$, then $f''(x) =$

   (a) $\boxed{\frac{2\sin x}{\cos^3 x}}$

   (b) $\frac{1}{\sin^2 x}$

   (c) $\sec^2 x$

   (d) $2\sec x \tan x$

2. $\dfrac{d}{dx}\left(\dfrac{x}{x-1}\right) =$

   (a) $-\frac{x}{(x-1)^2}$

   (b) 1

   (c) $\boxed{-\frac{1}{(x-1)^2}}$

   (d) $\frac{1}{(x-1)^2}$

3. If $x^2 - y^2 = 4$, then $\dfrac{dy}{dx} =$

   (a) $\dfrac{y}{x}$

   (b) $-\dfrac{y}{x}$

   (c) $\boxed{\dfrac{x}{y}}$

   (d) $-\dfrac{x}{y}$

4. If $f(x) = \sqrt[5]{x^2+1}$, then $f'(x) =$

   (a) $\frac{1}{5}(x^2+1)^{-4/5}$

   (b) $\boxed{\dfrac{2x}{5(x^2+1)^{4/5}}}$

   (c) $\dfrac{2x}{5(x^2+1)^{2/5}}$

   (d) $\frac{1}{5}x(x^2+1)^{-2/5}$

5. $\lim_{x \to -\infty} \dfrac{x^3 - 4x^2 + 1}{-x + 5} =$

   (a) -1

   (b) 0

   (c) ∞

   (d) $\boxed{-\infty}$

6. A man walks with a speed of 4 ft./s along a straight path. A searchlight 15 ft. away from the nearest point on the path stays focused on the man. At what rate is the searchlight rotating when the man is 40 ft. from the searchlight?

   (a) $\boxed{\frac{3}{80} \text{ radians/s}}$

   (b) $\frac{3}{8}$ radians/s

   (c) $\frac{4}{15}$ radians/s

   (d) $\frac{8}{3}$ radians/s

7. A mass attached to the end of a spring is pulled and then released. t seconds after release, the distance of the mass from equilibrium is $s(t) = \cos 2\pi t$ centimeters. The acceleration of the mass after 3 seconds is

   (a) 0 cm/s^2

   (b) -4π cm/s^2

   (c) $\boxed{-4\pi^2 \text{ cm/s}^2}$

   (d) -2π cm/s^2

8. $\sqrt[3]{126.5}$ is closest to

   (a) 5.01

   (b) $\boxed{5.02}$

   (c) 5.03

   (d) 5.04

9. The absolute minimum of $f(x) = -x^2 + 6x + 1$ on the interval $[0, 5]$ is at $x =$

   (a) $\boxed{0}$

   (b) 1

   (c) 2

   (d) 3

10. The graph of $g(x) = \frac{2}{3}x^3 - 2x^2$ is $\boxed{\text{(c)}}$ (see the practice exam for the graphs).

11. The function $f(x) = \cos x - x$

    (a) is an even function

    (b) is an odd function

    (c) $\boxed{\text{is neither an even nor an odd function}}$

12. A box with no lid is to be made from a 12×12-inch piece of cardboard by cutting out a square from each corner and then folding along the dotted lines, as shown. How big should the cut-out squares be in order to maximize the volume of the resulting box?

    (a) 1.5 inches

    (b) $\boxed{\text{2 inches}}$

    (c) 2.5 inches

    (d) 3 inches

13. The function $f(x) = x^4 - 6x^2$ is increasing on the intervals

    (a) $(0, \sqrt{3})$ only

    (b) $(-\infty, -\sqrt{3})$ and $(0, \sqrt{3})$ only

    (c) $(\sqrt{3}, \infty)$ only

    (d) $\boxed{(-\sqrt{3}, 0) \text{ and } (\sqrt{3}, \infty) \text{ only}}$

14. The function $f(x) = x^4 - 6x^2$ is concave down on the intervals

    (a) $\boxed{(-1, 1) \text{ only}}$

    (b) $(-\sqrt{3}, \sqrt{3})$ only

    (c) $(-\infty, -1)$ and $(1, \infty)$ only

    (d) $(1, \sqrt{3})$ only

15. If $x_1 = 1$ is a first approximation of a solution to the equation $x^4 = 6 - 3x$, then using Newton's Method the second approximation is $x_2 =$

    (a) $\boxed{\frac{9}{7}}$

    (b) $\frac{5}{7}$

    (c) $\frac{9}{2}$

    (d) $-\frac{5}{2}$