MA 16010 - Practice Exam 1

1. Which function below has a period of 4π, a maximum of 25.5 and a minimum of 19.5?

   A. $y = -3\sin 0.5x + 19.5$

   B. $y = 3\cos 0.5x + 25.5$

   C. $y = -3\sin 0.5\pi x - 22.5$

   D. $y = 3\cos 2x - 19.5$

   E. $y = 3\cos 0.5x + 22.5$

2. Find the domain of $f(x) = \dfrac{3x}{2e^x - 4e^{-x}}$.

   A. $(-\infty, \ln 2) \cup (\ln 2, \infty)$

   B. $(-\infty, \frac{1}{2}\ln 2) \cup (\frac{1}{2}\ln 2, \infty)$

   C. $(-\infty, \ln 4) \cup (\ln 4, \infty)$

   D. $(-\infty, \ln \frac{1}{2}) \cup (\ln \frac{1}{2}, \infty)$

   E. $(-\infty, 2\ln \frac{1}{2}) \cup (2\ln \frac{1}{2}, \infty)$

3. Find all real solutions of the equation $\sin(3x) = -\frac{1}{2}$.

   A. $\frac{7\pi}{18} + \frac{2\pi n}{3}, \frac{11\pi}{18} + \frac{2\pi n}{3}$; n is an integer
   B. $\frac{21\pi}{6} + \frac{2\pi n}{3}, \frac{33\pi}{6} + \frac{2\pi n}{3}$; n is an integer
   C. $\frac{7\pi}{18} + 2\pi n, \frac{11\pi}{18} + 2\pi n$; n is an integer
   D. $\frac{7\pi}{9} + 2\pi n, \frac{11\pi}{9} + 2\pi n$; n is an integer
   E. $\frac{5\pi}{18} + \frac{2\pi n}{3}, \frac{7\pi}{18} + \frac{2\pi n}{3}$; n is an integer

4. Find the limit:

$$\lim_{x \to 2} \frac{\sqrt{4x+8}}{x^2+1}$$

   A. $\frac{4}{5}$
   B. 1
   C. $\frac{16}{5}$
   D. 4
   E. $\frac{2}{3}$

5. $f(x) = \begin{cases} x+2 & : x < -1 \\ -x-2 & : x \geq -1 \end{cases}$

Choose the number of correct statements below.

I. f is not continuous at $x = -1$.

II. $\lim_{x \to -1^+} f(x) = 1$.

III. $\lim_{x \to -1} f(x) = 1$.

IV. $\lim_{x \to -1^-} f(x) \neq \lim_{x \to -1^+} f(x)$.

A. None of the above statements is true.

B. Only one of the above statements is true.

C. Only two of the above statements are true.

D. Only three of the above statements are true.

E. All of the above statements are true.

6. Which of the following function has a **non-removable** discontinuity at $x = -3$?

A. $y = x + 3$

B. $y = \dfrac{x^2 + 3x}{x + 3}$

C. $y = \dfrac{x + 3}{x - 3}$

D. $y = \dfrac{x + 3}{3 - x}$

E. $y = \dfrac{x - 3}{x^2 - 9}$

7. A ball is thrown straight up from the top of a 64-foot building with an initial velocity of 32 feet per second. Use the position function below for free-falling objects and find its velocity after 2 seconds.

$$s(t) = -16t^2 + v_0 t + s_0$$

A. -32 ft/sec

B. 64 ft/sec

C. -16 ft/sec

D. 48 ft/sec

E. -64 ft/sec

8. Which of following does **NOT** equal to positive infinity $(+\infty)$?

A. $\lim_{x \to 0} \frac{1}{x^2}$

B. $\lim_{x \to 1^+} \frac{1}{x-1}$

C. $\lim_{x \to 3^+} \frac{x}{\sqrt{x^2-9}}$

D. $\lim_{x \to 2^-} \frac{x+2}{x-2}$

E. $\lim_{x \to 1} \frac{1}{(x-1)^2}$

9. A student used the limit process to find the derivative of $f(x) = \dfrac{x^2}{2}$ and his work is shown below. Which of the following statements is true?

$$\begin{aligned} f'(x) &= \lim_{h\to 0} \frac{\dfrac{(x+h)^2}{2} - \dfrac{x^2}{2}}{h} && (1)\\ &= \lim_{h\to 0} \frac{x^2+2xh+h^2-x^2}{2h} && (2)\\ &= \lim_{h\to 0} \frac{2xh+h^2}{2h} && (3)\\ &= \lim_{h\to 0} (x+h^2) && (4)\\ &= x && (5) \end{aligned}$$

A. He made a mistake in Line (1).
B. He made a mistake in Line (2).
C. He made a mistake in Line (3).
D. He made a mistake in Line (4).
E. He made a mistake in Line (5).

10. Find the equation of the tangent line to the graph of $g(x) = \dfrac{x^2 + 32\sqrt{x}}{8}$ at $x = 4$.

A. $y = 5x - 30$
B. $y = 2x + 2$
C. $y = 5x - 10$
D. $y = 2x - 18$
E. $y = 2x + 10$

11. Find the derivative of $y = (\sin x + \tan x)e^x$.

    A. $y' = (\cos x + \sec^2 x)e^x$

    B. $y' = (\sin x + \cos x + \tan x + \sec x)e^x$

    C. $y' = (\sin x + \cos x + 2\tan x)e^x$

    D. $y' = (\sin x + \cos x + \tan x + \sec^2 x)e^x$

    E. $y' = (\sin x + \cos x + \tan x + \sec x \tan x)e^x$

12. The population P, in thousands, of a small city is given by

$$P(t) = 10 + \frac{50t}{2t^2 + 9}$$

    where t is the time in years. What is the rate of change of the population at $t = 2$ yr? Round your answer to the third decimal place.

    A. -1.557 thousand per year

    B. 3.214 thousand per year

    C. 0.173 thousand per year

    D. 2.941 thousand per year

    E. 5.882thousand per year