AB PRACTICE TEST 2
Section I, Part A: Multiple-Choice Questions
Time: 55 minutes
Number of Questions: 28

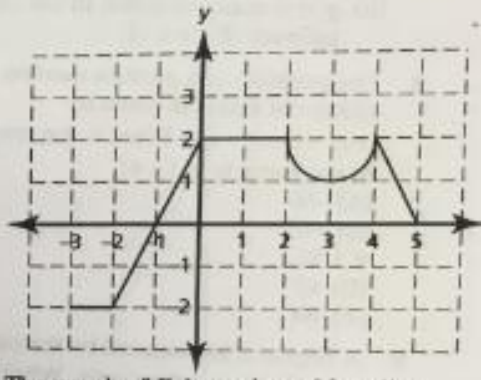
A calculator may not be used on this part of the examination.

1. In what interval is $f(x) = \ln(x^2 - 1)$ decreasing?
   (A) $|x| > 1$
   (B) $|x| \geq 1$
   (C) $x < -1$
   (D) $x > 1$
   (E) $x > 0$

2. Find the limit $\lim_{x \to 0} \frac{\cos x}{|x|}$.
   (A) 0
   (B) 1
   (C) –1
   (D) π
   (E) The limit does not exist.

3. $\int \left[3^{-x} + \frac{1}{x}\right] dx = ?$
   (A) $3^{-x} + \ln|x| + C$
   (B) $-3^{-x} - \frac{1}{x^2} + C$
   (C) $-3^{-x} \ln 3 + \ln|x| + C$
   (D) $-\frac{3^{-x}}{\ln 3} + \ln|x| + C$
   (E) $-\frac{3^{-x}}{\ln 3} - \frac{1}{x^2} + C$

4. Find $\frac{dy}{dx}$ for $\cos(x+y) = x$.
   (A) $-\csc(x+y) - 1$
   (B) $\frac{\cos(x+y)}{\sin^2(x+y)}$
   (C) $\frac{x}{1-x^2}$
   (D) $-\sin(x+y) \cdot \cot(x+y)$
   (E) $-\sin(x+y) - 1$



The graph of $f(x)$ consists of four line segments and a semicircle as shown above in the closed interval $-3 \leq x \leq 5$. Let g be the function given by $g(x) = \int_0^x f(t)\, dt$. Use this information for problems 5–7.

5. What is $g(-1) + g'(-1) + g''(-1)$?
   (A) –1
   (B) 0
   (C) 1
   (D) 2
   (E) 3

6. What is $\int_{-3}^{5} f(t)\, dt$?
   (A) $7 - \pi$
   (B) $7 - \frac{\pi}{2}$
   (C) $7 - \frac{\pi}{4}$
   (D) $12 - \frac{\pi}{2}$
   (E) $12 - \frac{\pi}{4}$

7. Which of the following statements is false for $g(x)$?
   (A) The absolute maximum for $g(x)$ occurs at $x = 5$.
   (B) A relative minimum for $g(x)$ occurs at $x = -1$.
   (C) A point of inflection for $g(x)$ occurs at $x = 3$.
   (D) $g(x)$ has roots at $x = 0$ and $x = -2$.
   (E) $g(x)$ is concave down in the open interval $-2 < x < -1$.

8. The position of a particle moving along the x-axis is given by $x(t) = 2 + 3t - t^3$. What is the speed of the particle at $t = 4$?
   (A) −50
   (B) −45
   (C) 32
   (D) 45
   (E) 50

9. A region R is bounded by the curve $x = y^2 - 1$ and the y axis. What is the volume generated when region R is rotated about the y-axis?
   (A) $\frac{\pi}{2}$
   (B) $\frac{8\pi}{15}$
   (C) π
   (D) $\frac{16\pi}{15}$
   (E) $\frac{4\pi}{3}$

10. Which of the following statements is true for $f(x) = \sqrt[3]{x} + 1$?
    I. $f(x)$ is always increasing, $x \neq 0$.
    II. The tangent to the curve at $x = 0$ is horizontal.
    III. The Mean Value Theorem can be applied to $f(x)$ in the closed interval $-1 \leq x \leq 1$.
    (A) I only
    (B) II only
    (C) III only
    (D) II and III only
    (E) I, II, and III

11. The acceleration of a model car along an incline is given by $a(t) = \frac{t^2 + t}{t^2 + 1}$ cm/sec^2, for $0 \leq t < 1$. If $v(0) = 1$ cm/sec, what is $v(t)$?
    (A) $\tan^{-1} t + \frac{1}{2}\ln(t^2 + 1) + 1$ cm/sec
    (B) $\tan^{-1} t - \frac{1}{2}\ln(t^2 + 1) + 1$ cm/sec
    (C) $t - \frac{1}{2}\ln(t^2 + 1) - \tan^{-1} t + 1$ cm/sec
    (D) $t + \frac{1}{2}\ln(t^2 + 1) + \tan^{-1} t + 1$ cm/sec
    (E) $t - \frac{1}{2}\ln(t^2 + 1) + \tan^{-1} t + 1$ cm/sec

t	$R(t)$
0	12
2	18
4	10
6	15
8	12
10	16
12	8

12. Water is dripping into a vase at a variable rate. The rate, $R(t)$ in cm^3/min, is recorded every 2 mins for 12 mins, as listed in the chart above. Using a right Riemann sum with 3 equal intervals, find the approximate average rate at which the water drips into the vase over the 12 mins.
    (A) 10 cm^3/min
    (B) $10\frac{1}{3}$ cm^3/min
    (C) $16\frac{1}{3}$ cm^3/min
    (D) 40 cm^3/min
    (E) $41\frac{1}{3}$ cm^3/min