1. $\lim\limits_{x \varnothing \infty} \dfrac{9x^4 + x - 3}{2x^4 + 5x^2 - x + 6} = ?$

(A) $-\frac{1}{2}$ (B) 0 (C) $-\frac{3}{2}$ (D) $\frac{9}{2}$ (E) does not exist

2. The graph of $y = \dfrac{x^2 - x + 1}{x + 1}$ has asymptotes

(A) $y = 0$ and $x = -1$
(B) $y = x - 2$ and $x = -1$
(C) $y = x + 1$ and $x = -1$
(D) $y = x - 1$ and $x = -1$
(E) $y = x$ and $x = -1$

3. Given the function $y = \dfrac{x^2 - 4}{x^2 + 2}$, one finds by straight forward computation that

$$\frac{dy}{dx} = \frac{12x}{(x^2 + 2)^2}, \qquad \frac{d^2y}{dx^2} = \frac{12(2 - 3x^2)}{(x^2 + 2)^3}$$

Based on your analysis of the intercepts, asymptotes, local extreme points and inflection points, the curve below that is the graph of this function is:

(A)

(B)

(C)

(D)

(E)

4. A rectangular box has a square base and no top. The combined area of the sides and bottom is 48 ft^2. The largest volume (in ft^3) that such a box can have is

(A) 12 (B) $12\left(2\sqrt{2} - 1\right)$ (C) 24 (D) $16\sqrt{3}$ (E) 32

5. Use the tangent line approximation to find an approximate value of tan (0.26π)

(A) 1.06 (B) 1.08 (C) 1.05 (D) 1.10 (E) 1.07

6. It is guessed that $x_0 = 1$ is close to a root of the function $f(x) = x^3 - 4x^2 + 6x - 2$. The approximation to the root given by applying Newton's method twice is $x_2 =$

(A) 2 (B) $\frac{1}{3}$ (C) 0 (D) $\frac{4}{5}$ (E) $\frac{1}{4}$

7. $\int \left(8 \sin^2 x + 4 \cos x\right) dx = ?$

(A) $4x + 2 \sin 2x + 4 \cos x + C$

(B) $16 \sin x \cos x - 4 \cos x + C$

(C) $4x - 2 \sin 2x + 4 \sin x + C$

(D) $\frac{8}{3} \sin^3 x + 4 \sin x + C$

(E) $4x - 2 \sin 2x + 2 \cos 2x + 4 \sin x + C$

8. The State of Illinois Cycle Rider Safety Program requires riders to be able to brake from 30 mph (44 ft/sec) to 0 in 45 ft. What constant deceleration (in ft/sec^2) does it take to do that ?

(A) 21.7 (B) 21.2 (C) 22.1 (D) 21.3 (E) 21.5

9. $\displaystyle\int \frac{\sin(2t+1)}{\cos^2(2t+1)}\,dt = ?$

(A) $2\tan(2t+1) + C$

(B) $\frac{1}{4}\csc(2t+1) + C$

(C) $-\sec(2t+1)\tan(2t+1) + C$

(D) $\frac{1}{2}\sec(2t+1) + C$

(E) $\cot(2t+1)\csc(2t+1) + C$

10. Let $f(x) = 21 - x^3$, let $P = \left\{1, \frac{3}{2}, \frac{5}{2}, 4\right\}$ be a partition of the interval $[1,4]$ and let $c_1 = 1$, $c_2 = 2$, $c_3 = 3$ be numbers chosen in the three subintervals of P. The value of the resulting Riemann sum for f on the interval $[1,4]$ is

(A) 14 (B) $\frac{29}{2}$ (C) 12 (D) $\frac{27}{2}$ (E) 16