1. A cylindrical can with a bottom but no top has volume V. The radius of such a can with least possible surface area is

(A) $V + \pi$ (B) $\left(\frac{V}{\pi}\right)^{\frac{1}{3}}$ (C) $(2V)^{\frac{1}{3}}$ (D) $\frac{V}{\pi}$ (E) $\sqrt{\frac{V}{\pi}}$

2. If $N = (1.99)^5 - 2(1.99)^2 + 1$ and we use the tangent line approximation to obtain the approximate value of N we obtain

(A) 24.32   (B) 25.72   (C) 24.28   (D) 25.70   (E) 24.30

3. The iterative scheme using Newton's Method for computing $\sqrt[4]{3}$ is

(A) $x_{n+1} = \frac{2}{3} x_n + \frac{1}{x_n^2}$ (B) $x_{n+1} = \frac{x_n}{4} + \frac{3}{x_n^3}$

(C) $x_{n+1} = x_n + \frac{3}{4x_n}$ (D) $x_{n+1} = \frac{x_n}{2} + \frac{4}{3x_n^2}$

(E) $x_{n+1} = \frac{3}{4}\left(x_n + \frac{1}{x_n^3}\right)$

4. The general antiderivative of $1 - \sin^2 t$ is

(A) $t - \frac{\sin^3 t}{3} + C$ (B) $\frac{t}{2} + \frac{\sin 2t}{4} + C$

(C) $t - \sin 2t + C$ (D) $\frac{t}{2} - \frac{\cos 2t}{4} + C$

(E) $- \frac{\cos^2 t}{3} \sin t + C$

5. A train is cruising at 60 mph when suddenly the engineer notices a cow on the track ahead of the train. The engineer applies the brakes, causing a constant deceleration in the train. Two minutes later the train grinds to a halt, barely touching the cow, which is too frightened to move. How far back was the train when the brakes were applied?

(A) 1 mile (B) $\frac{3}{2}$ mile (C) $\frac{1}{4}$ mile (D) $\frac{5}{8}$ mile (E) $\frac{3}{4}$ mile

6. A function $y = f(x)$ has a graph in the xy–plane which passes through the point $(1,4)$ with slope 2.

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

(A) $\dfrac{1}{4x^2} + 4x - \dfrac{1}{4}$

(B) $\dfrac{3}{2x} + \dfrac{7}{2}x - 1$

(C) $\dfrac{1}{x^4} + 6x - 3$

(D) $\dfrac{1}{2x^2} + 3x + \dfrac{1}{2}$

(E) $\dfrac{3}{x^2} + 8x - 7$

7. $\displaystyle\int_0^1 15x^4\sqrt{3x^5 + 1}\ dx = ?$

(A) $\dfrac{16}{3}$ (B) 4 (C) $\dfrac{14}{3}$ (D) 5 (E) $\dfrac{13}{3}$

8. Let $f(x) = x^2 - 6x + 10$, let $P = \left\{ 0, \dfrac{3}{2}, \dfrac{5}{2}, 3 \right\}$ 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 [0, 3] is

(A) 9 (B) $\frac{21}{2}$ (C) 12 (D) $\frac{19}{2}$ (E) 10

9. Find the area of the shaded region

(A) $\frac{8}{3}$ (B) $\frac{5}{2}$ (C) 3 (D) $\frac{17}{6}$ (E) $\frac{13}{5}$

10. If the function F is defined by the equation $F(x) = \int_0^x \frac{1}{1+t^2}\,dt$, then the graph of F most clearly resembles

(A)

(B)

(C)

(D)

(E)