1107. $\int_{\pi/6}^{\pi/2} \cot x \, dx =$

A) $\ln \frac{1}{2}$ B) $\ln 2$ C) $\frac{1}{2}$ D) $\ln(\sqrt{3}-1)$ E) None of these

1108. $\int_{-2}^{3} |x+1| \, dx =$

A) $\frac{5}{2}$ B) $\frac{17}{2}$ C) $\frac{9}{2}$ D) $\frac{11}{2}$ E) $\frac{13}{2}$

1109. $\int_{1}^{2} (3x-2)^3 \, dx =$

A) $\frac{16}{3}$ B) $\frac{63}{4}$ C) $\frac{13}{3}$ D) $\frac{85}{4}$ E) None of these

1110. $\int_{\pi/4}^{\pi/2} \sin^3\theta \cos\theta \, d\theta =$

A) $\frac{3}{16}$ B) $\frac{1}{8}$ C) $-\frac{1}{8}$ D) $-\frac{3}{16}$ E) $\frac{3}{4}$

1111. $\int_{0}^{1} \frac{e^x}{(3-e^x)^2} \, dx =$

A) $3\ln(e-3)$ B) 1 C) $\frac{1}{3-e}$ D) $\frac{e-1}{2(3-e)}$ E) $\frac{e-2}{3-e}$

1112. $\int_{-1}^{0} e^{-x} \, dx =$

A) $1-e$ B) $\frac{1-e}{e}$ C) $e-1$ D) $1-\frac{1}{e}$ E) $e+1$

1113. $\int_{0}^{1} \frac{x}{x^2+1} \, dx =$

A) $\frac{\pi}{4}$ B) $\ln\sqrt{2}$ C) $\frac{1}{2}(\ln 2 - 1)$ D) $\frac{3}{2}$ E) $\ln 2$

Anyone who cannot cope with mathematics is not fully human. At best he is a tolerable subhuman who has learned to wear shoes, bathe, and not make messes in the house. —*Robert A. Heinlein*

1114. The acceleration of a particle moving along a straight line is given by $a = 6t$. If, when $t = 0$ its velocity $v = 1$ and its distance $s = 3$, then at any time t the position function is given by

A) $s = t^3 + 3t + 1$

B) $s = t^3 + 3$

C) $s = t^3 + t + 3$

D) $s = \frac{1}{3}t^3 + t + 3$

E) $s = \frac{1}{3}t^3 + \frac{1}{2}t^2 + 3$

1115. If the displacement of a particle on a line is given by $s = 3 + (t-2)^4$, then the number of times the particle changes direction is

A) 0 B) 1 C) 2 D) 3 E) None of these

1116. $\displaystyle\int_0^{\pi/2} \cos^2 x \sin x \, dx =$

A) -1 B) $-\frac{1}{3}$ C) 0 D) $\frac{1}{3}$ E) 1

1117. $\displaystyle\int_0^1 (3x^2 - 2x + 3) \, dx =$

A) 0 B) 5 C) 3 D) 8 E) None of these

1118. $\displaystyle\int_1^e \left(x - \frac{1}{2x}\right) dx =$

A) $\frac{1}{2}e^2$ B) $\frac{1}{2}e^2 + 1$ C) $\frac{1}{2}(e^2 + 1)$ D) $\frac{1}{2}(e^2 - 1)$ E) None of these

1119. $\displaystyle\int_0^1 (2 - 3x)^5 \, dx =$

A) $-\frac{1}{2}$ B) $\frac{1}{6}$ C) $\frac{1}{2}$ D) $-\frac{1}{18}$ E) None of these

1. $\int \sin 3\theta \, d\theta =$

A) $3\cos 3\theta + C$

B) $-3\cos 3\theta + C$

C) $-\cos 3\theta + C$

D) $\frac{1}{3}\cos 3\theta + C$

E) $-\frac{1}{3}\cos 3\theta + C$

---

2. $\int 3^{x^2} x \, dx =$

A) $\dfrac{3^{x^2+1}}{x^2+1} + C$

B) $\dfrac{3^{x^2}}{\ln 9} + C$

C) $3^{x^2} \ln 3 + C$

D) $3^{x^3/3} + C$

E) None of these

---

3. Let $f(x)$ be defined as below. Evaluate $\int_0^6 f(x) \, dx$.

$$f(x) = \begin{cases} x & 0 < x \leq 2 \\ 1 & 2 < x \leq 4 \\ \frac{1}{2}x & 4 < x \leq 6 \end{cases}$$

A) 5

B) 6

C) 7

D) 8

E) 9

4. $\int_0^1 \frac{x}{x^2+1}\,dx =$

A) $\frac{\pi}{4}$

B) $\ln\sqrt{2}$

C) $\frac{1}{2}(\ln 2 - 1)$

D) $\frac{3}{2}$

E) $\ln 2$

---

5. The average value of $g(x) = (x-3)^2$ in the interval $[1,3]$ is

A) 2

B) $\frac{2}{3}$

C) $\frac{4}{3}$

D) $\frac{8}{3}$

E) None of these

---

6. $\int_0^5 \frac{dx}{\sqrt{3x+1}} =$

A) $\frac{1}{2}$

B) $\frac{2}{3}$

C) 1

D) 2

E) 6