1. $\int x \sin x \; dx =$

A) $-x \cos x + C$

B) $-x \cos x - \sin x + C$

C) $-x \cos x + \sin x + C$

D) $\frac{1}{2}x^2 \sin x + C$

E) $-x \cos x - \cos x + C$

---

2. $\int_1^e \dfrac{\ln x}{x} \; dx =$

A) undefined

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

C) 2

D) $\frac{1}{2}(e-1)$

E) None of these

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3. The area of the region bounded by the lines $x = 0$, $x = 2$, $y = 0$, and the curve $y = e^{x/2}$ is

A) $\frac{1}{2}(e-1)$

B) $e - 1$

C) $2(e-1)$

D) $2e - 1$

E) $2e$

4. $\lim_{h\to 0} \dfrac{-1+e^{-h}}{h} =$

A) 1

B) 0

C) -1

D) $\frac{1}{e}$

E) ∞

---

5. Evaluate $\displaystyle\int_1^\infty x^{-1/2}\,dx$.

A) 3

B) 2

C) 1

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

E) divergent

---

6. $\displaystyle\int \frac{1}{x^2+x}\,dx =$

A) $\frac{1}{2}\arctan\left(x+\frac{1}{2}\right)+C$

B) $\ln|x^2+x|+C$

C) $\ln\left|\dfrac{x+1}{x}\right|+C$

D) $\ln\left|\dfrac{x}{x+1}\right|+C$

E) None of these

7. $\displaystyle\int \frac{x}{x+2}\,dx =$

A) $x \ln|x+2| + C$

B) $x + 2\ln|x+2| + C$

C) $x - 2\ln|x+2| + C$

D) $x - \ln|x+2| + C$

E) $x - \arctan x + C$

---

8. A particle moves on the x-axis in such a way that its position at time t, for $t > 0$, is given by $x(t) = (\ln x)^2$. At what value of t does the velocity of the particle attain its maximum?

A) 1

B) $e^{1/2}$

C) e

D) $e^{3/2}$

E) e^2

---

9. The substitution of $x = \sin\theta$ in the integrand of $\displaystyle\int_0^{1/2} \frac{x^2}{\sqrt{1-x^2}}\,dx$ results in

A) $\displaystyle\int_0^{1/2} \frac{\sin^2\theta}{\cos\theta}\,d\theta$

B) $\displaystyle\int_0^{1/2} \sin^2\theta\,d\theta$

C) $\displaystyle\int_0^{\pi/6} \sin^2\theta\,d\theta$

D) $\displaystyle\int_0^{\pi/3} \sin^2\theta\,d\theta$

E) $\displaystyle\int_0^{1/2} \frac{\cos^2\theta}{\sin\theta}\,d\theta$

10. The area of the region in the first quadrant under the curve $y = \dfrac{1}{\sqrt{1-x^2}}$, bounded on the left by $x = \frac{1}{2}$, and on the right by $x = 1$ is

A) ∞

B) π

C) $\pi/2$

D) $\pi/3$

E) None of these

---

11. The length of the curve $y = \displaystyle\int_0^x \sqrt{\frac{t}{3}}\, dt$ from $x = 0$ to $x = 9$ is

A) 16.

B) 14.

C) $\frac{31}{3}$.

D) $9\sqrt{3}$.

E) $\frac{14}{3}$.

---

12. Evaluate $\displaystyle\int_{-5}^{5} \sqrt{25-x^2}\, dx$.

A) 0

B) 5

C) $25\pi/2$

D) 25π

E) 50π

13. Consider the function g defined by $g(x) = \int_1^x (t^3 - 3t^2 + 2t)\ dt$. The number of relative extrema of g is

A) 1.

B) 2.

C) 3.

D) 4.

E) more than 4.

---

14. The function $t(x) = 2^x - \dfrac{|x-3|}{x-3}$ has

A) a removable discontinuity at $x = 3$.

B) an infinite discontinuity at $x = 3$.

C) a jump discontinuity at $x = 3$.

D) no discontinuities.

E) a removable discontinuity at $x = 0$ and an infinite discontinuity at $x = 3$.

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15. Find the values of c so that the function

$$h(x) = \begin{cases} c^2 - x^2 & x < 2 \\ x + c & x \geq 2 \end{cases}$$

is continuous everywhere.

A) $-3, -2$

B) $2, 3$

C) $-2, 3$

D) $-3, 2$

E) There are no such values.