

1. Compute the following limit:

$$\lim_{x \rightarrow 2} \frac{x^2 - 4}{x - 2}$$

2. Are there real values of x for which $f(x) = x^2 + 2x + 2$ is equal to zero? Justify your answer.

3. For $a \notin \{0, -1\}$ and $\theta > 0$, compute the following:

$$\int_0^\theta x^a dx$$

4. Find the derivative of $f(x) = e^{ax^2+bx+c}$, where a , b , and c are nonzero constants.

5. Compute the following:

$$\frac{d^2}{dx^2} x e^x$$

6. What is the sum of the infinite series

$$\frac{1}{3} + \frac{1}{6} + \frac{1}{12} + \frac{1}{24} + \frac{1}{48} + \cdots?$$

7. Evaluate the following double integral:

$$\int_0^1 \int_0^x 2xy^2 dy dx$$

8. Compute the following:

$$\int_0^\infty x e^{-x} dx \quad \text{and} \quad \int_0^\infty x^2 e^{-x} dx$$

9. Evaluate the following:

$$\lim_{x \rightarrow 0} x e^x \quad \lim_{x \rightarrow \infty} x e^x \quad \lim_{x \rightarrow 0} x e^{-x} \quad \lim_{x \rightarrow \infty} x e^{-x}$$

10. Find the derivative of $f(x) = x/\ln(x)$.

11. Compute the following limit:

$$\lim_{n \rightarrow \infty} \left(1 + \frac{1}{n}\right)^n$$

12. Write $(x + y)^6$ using a binomial expansion.

13. Compute the following limit:

$$\lim_{n \rightarrow \infty} \left(1 - \frac{a}{n}\right)^n$$

14. Compute

$$\sum_{j=0}^{\infty} \frac{a^j}{j!}$$

15. Find

$$\int_0^{\infty} \int_x^{x+1} e^{-y} dy dx$$

16. Find the derivatives of the following functions and evaluate their derivatives at $t = 0$.

$$f(t) = (0.3 + 0.7e^t)^{10} \quad \text{and} \quad f(t) = e^{10t+t^2/2}$$

17. Compute

$$\int_0^1 e^x \sqrt{1 - e^x} dx$$

18. Compute

$$\int_0^a \frac{\ln x}{x} dx$$

19. For what values of r does the series

$$\sum_{y=0}^{\infty} r^y$$

converge? What is the limit?

20. Find the McLaurin Series expansion of the function $f(x) = \sin x$.

21. Use numerical integration techniques (or a computer) to approximate

$$\int_{-1}^1 \frac{1}{\sqrt{2\pi}} e^{-x^2/2} dx$$

22. Suppose that $f(x) = 8x^3 - 1$. Write a formula for the inverse of f .

23. Find

$$\lim_{x \rightarrow 0^+} x \ln x$$