1. Evaluate
$$\int 9x \, e^{4x} \, dx$$

2. Evaluate
$$\int 10x \ln(2x) \, dx$$

3. Evaluate
$$\int x \sqrt[3]{x + 3} \, dx$$

4. Find the average value of the function on the given interval.
$$f(x) = e^{x/3}, \quad [1, 2]$$

5. Find the average value of the function on the given interval.
$$f(x) = \sqrt{x + 1}, \quad [0, 8]$$

6. The function $f(x) = 600$ represents the rate of flow of money in dollars per year. Assume a 20-year period at 4% compounded continuously. Find (a) the present value, and (b) the accumulated amount of money flow at $t = 20$.

7. The function $f(x) = 1500e^{0.02x}$ represents the rate of flow of money in dollars per year. Assume a 15-year period at 4% compounded continuously. Find (a) the present value, and (b) the accumulated amount of money flow at $t = 15$.

8. Find the area, if it is finite, of the region under the graph of $y = \dfrac{5}{2x^2}$ over the interval $[2, \infty)$.

9. Determine whether the integral
$$\int_{-\infty}^{-5} \frac{4}{x^4} \, dx$$
converges or diverges, and find the value if it converges.

10. Find the area between the graph of $f(x) = \dfrac{8}{x - 4}$ and the x-axis over the interval $(-\infty, 0]$, if possible.

11. If labor (x) costs \$256 per unit, materials (y) cost \$122 per unit, and capital (z) costs \$84 per unit, write a function for the total cost.

12. For the function $f(x, y) = \sqrt{y^2 + 4x^2}$, find $f(2, -3)$, $f(-5, -5)$ and $f(0, 6)$.

13. For the function $z = f(x, y) = -4x^3 - 6y^2 + 3xy$, find $\frac{\partial z}{\partial x}$, $\frac{\partial z}{\partial y}$, $f_x(4, 0)$, and $f_y(4, 0)$.

14. For the function $z = f(x, y) = \ln | 9x^4 + 5x^2y^2 |$, find $f_x(x, y)$ and $f_y(x, y)$. Then find $f_x(2, -1)$ and $f_y(-4, 3)$.

15. Find the four second order partial derivatives $f_{xx}, f_{yy}, f_{xy}, f_{yx}$ for

$$f(x, y) = 8x^5y^6 + 7x^8y^4$$

16. Find the local maxima, local minima, and the saddle points of the given function.

$$f(x, y) = x^2 - 6xy + y^2 + 16y + 7$$

17. Find all local extrema for the function

$$f(x, y) = 4y^4 - 32y^2 + 8x^2 - 16$$

18. Use the echelon method to solve the system of equations.

$$
\begin{aligned}
4x - 2y + 5z &= 72 \\
5x - 4y - 4z &= 2 \\
x - y + 5z &= 46
\end{aligned}
$$

19. Solve the system of equations by setting up an augmented matrix and using the Gauss-Jordan Method.

$$
\begin{aligned}
x + 2y - z &= 2 \\
2x + z &= 5 \\
y - 3z &= -7
\end{aligned}
$$

20. Solve the system of equations in Question # 19 by finding and using the inverse of the coefficient matrix.