

1. A company that spends x thousand dollars on marketing and y thousand dollars on development makes a profit of $xy + x + y$ thousand dollars. If the company has a budget of 30,000 dollars, find how much the company should spend on marketing and development in order to maximize profit. Then, give the maximum profit.
2. Find all the maximum values and minimum values of $f(x, y) = x^2y$ subject to the constraint $x^2 + 2y^2 = 6$. Be sure to write the maximum and minimum values of f as well as the points where they occur.
3. Evaluate the integrals

(a)

$$\int_0^1 \int_2^3 6ye^{xy} dx dy$$

(b)

$$\int_0^1 \int_x^{x^2} 24yxdy dx$$

4.

- (a) Write the infinite series in compact form:

$$-1 + \frac{1}{4} - \frac{2}{7} + \frac{6}{10} - \frac{24}{13} + \frac{120}{16} - \dots$$

Determine if each of the following geometric series converge. If the series converges, compute what value the series converges to.

(b)

$$\sum_{n=0}^{\infty} \frac{7^{n+1}}{6^{n-1}}$$

(c)

$$\sum_{n=1}^{\infty} 12e^{(0.7)n}$$

(d)

$$\sum_{n=2}^{\infty} e^{(-0.1)n}$$

5.

- (a) Write this function as a power series:

$$\frac{2x}{3 + x^2}$$

- (b) Determine the radius of convergence and the interval of absolute convergence for the power series

$$\sum_{n=6}^{\infty} \frac{3^{n+1}(-2)^n}{n!} x^n$$

6. Give the Taylor series for $f(x) = (1 + 2x)e^x$ about $a = 0$.