MAT 201 Question

1. Find the area between the curve y = x(x − 3) and the ordinates x = 0 and x = 5
2. Find the area bounded by the curve y = $x^2 + x + 4$, the x-axis and the ordinates x = 1 and x = 3.
3. Find the area enclosed by the given curve, the x-axis, and the given ordinates
    1. The curve $y = x^2 + 3x$, from x = 1 to x = 3
    2. The curve $y = x^2 - 4$ from x = −2 to x = 2
    3. The curve $y = x - x^2$ from x = 0 to x = 2
4. Calculate the area of the segment cut from the curve y = x(3 − x) by the line y = x.
5. Find the area contained between the two curves $y = 3x - x^2$ and $y = x + x^2$.
6. Find the area contained between the line y = x and the curve $y = x^2$
7. Compute dy/dx for each question:
    1. $y = (2^x)cot(x)$
    2. $y = ln(1 + (x^3)e^x)$
    3. $y = e^x sin(x)$
    4. $y = \frac{x^3}{x^2+1}$
    5. $y = sin(x^2 e^x)$
    6. $y = 2^{x+cos(x)}$
    7. $y = (x^2)(sin^{-1}(x))$
    8. $y = \sqrt{1 - x^2}.\, cos^{-1}(x)$
8. For each of the following functions, verify that they satisfy the hypotheses of Rolle's Theorem on the given intervals and find all points c in the given interval for which $f\backslash 0(c) = 0$
   $f(x) = 2x^2 - 4x + 5$ on [−1, 3]
   g(x) = $x^3 - 2x^2 - 4x + 2$ on [−2, 2]
9. Let $f(x) = x^3 + 2x^2 - x - 1$, find all numbers c that satisfy the conditions of the Mean Value Theorem in the interval [−1, 2].
10. Write down the Taylor series for the following functions centered at a.
    1. $f(x) = e^{x2}$ centered at a = 0
    2. $g(x) = sin(\pi x)$ centered at a = 1
    3. Expand $\boldsymbol{f(x, y) = e^{xy}}$ in Taylors Series at (1, 1) upto second degree.
    4. Expand $\boldsymbol{e^x \log(1 + y)}$ in powers of x and y upto terms of second degree
11. Find $\frac{\partial f}{\partial x}$ and $\frac{\partial f}{\partial y}$ for the following functions:
    1. $f(x, y) = (x^2 - 1)(y + 2)$
    2. $f(x, y) = e^{x+y+1}$
    3. $f(x, y) = e^{-x} sin(x + y)$
    4. $f(x, y) = sin^2(x - 3y)$

12. Find the area in the first quadrant bounded by $f(x) = 4x - x^2$ and the x-axis.
13. Find the area bounded by the following curves: $, y = x^2 - 4, y = 0, x = 4$
14. Find the first quadrant area bounded by the following curves: $y = x^2 + 4, y = 4 and x = 0$
15. Integrate
    1. $9sin(3x)$
    2. $12cos(4x)$
    3. from x=4, x=1 $5x^2 - 8x + 5$
16. For $z(x, y) = x^3 + 3y - y^3 - 3x$
    1. Find the extremal points of the function $z(x, y)$
    2. Determine the Taylor expansion of $z(x, y)$ about the point $(x, y) = (2, 1)$
17. For $F(y, x) = y^2 - 2xy - x^2$
    1. Find the extremal points of the function
18. Use Lagrange multipliers to find the minimum and maximum value of $f(x, y) = e^x y$ on the curve $x^3 + y^3 = 16$
19. Work out the stationary points for the function $f(x, y) = x^2 + y^2$
20. A particle moves in a straight line with its position, x, given by the following equation: $x(t) = t^4 – 4t^3 + 2t^2 + 3t + 6.$
    1. Find its position after 1 second
    2. Find its velocity after 2 seconds.
    3. Find its acceleration after 3 seconds
21. Work out the stationary points for the function $f(x, y) = e^{-(x^2+y^2)}$
22. Work out the stationary points for the function $f(x, y) = 2 - x^2 - xy - y^2$
23. Work out the stationary points for the function $f(x, y) = 2x^3 + 6xy^2 - 3y^3 - 150x$
24. Find and classify all critical points for the function $f(x, y) = x^4 + y^4 - 4xy$
25. Find the absolute maximum and minimum values of the function $f(x, y) = 2 + 2x + 2y - x^2 - y^2$