Part I. Calculus I competency.

1. (5 pts) Find the equation of the tangent line to the graph of the function \( f(x) = \sqrt[7]{7-3x} \) at \( x = 1 \).

2. (5 pts) Find the derivative of \( a(x) = x^{-2/3} + \frac{4}{3x} \).

3. (5 pts) Find the derivative of \( b(x) = \frac{3x-2}{7-5x} \).

4. (5 pts) Find the derivative of \( c(x) = e^{-5x} \cos 9x \).

5. (5 pts) Find the derivative of \( e(x) = x^3 \ln x - 3x^2 \).

6. (5 pts) Find the derivative of \( f(x) = (2x^2 - x + 3)^4 \).

7. (5 pts) Find the indefinite integral \( \int (4x^7 - \sqrt[5]{x^5}) \, dx \).

8. (5 pts) Find the definite integral of \( \int_0^{\pi/2} (2x - \cos x) \, dx \).

9. (5 pts) Find the indefinite integral \( \int (7-8x)^9 \, dx \).

10. (5 pts) Find the indefinite integral \( \int \frac{\sin(\sqrt{x}) - 1}{\sqrt{x}} \, dx \).

Part II. Calculus II Competency.

11. (5 pts) Find the area the bounded in the first quadrant bounded between the graphs of \( y = x^2 + 2x \) and \( y = 6x \).

12. (5 pts) Find the indefinite integral \( \int xe^{2x} \, dx \).

13. (5 pts) Find the partial fraction decomposition for the function \( f(x) = \frac{3x-2}{x^2 + 4x} \).

14. (5 pts) Find the indefinite integral \( \int \frac{x-2}{(4x-x^2)^2} \, dx \).

15. (5 pts) Test the series for convergence: \( \sum_{k=1}^{\infty} \frac{\sqrt{k}}{2k^2 + 1} \).

16. (5 pts) Test the series for convergence: \( \sum_{k=1}^{\infty} \sqrt{k} \left( \frac{6}{5} \right)^{k-1} \).
17. (5 pts) Find the first four non-zero terms of the MacLaurin series of $f(x) = \sin(2x^2)$

Part III. Calculus III competency.

18. (5 pts) Find $f_x, f_y$ for $f(x,y) = xe^{y^2}$

19. (5 pts) Find $f_{xx}, f_{yx}$ for $f(x,y) = xe^{y^2}$

20. (5 pts) Find $f_x, f_y, f_z$ for $f(x,y,z) = \frac{y + \sqrt{z-x}}{z^3}$