Part I. Calculus I competency.

- 1. (5 pts) Find the equation of the tangent line to the graph of the function $f(x) = \sin(\pi z)$ at $x = 3\pi / 2$.
- 2. (5 pts) Find the derivative of $a(x) = x^{-7/3} \frac{6}{11x^3}$
- 3. (5 pts) Find the derivative of $b(x) = \frac{3x+4}{2-5x}$
- 4. (5 pts) Find the derivative of $c(x) = e^{-3x} \cos 7x$
- 5. (5 pts) Find the derivative of $e(x) = x^4 \ln x 4x^3$

6. (5 pts) Find the derivative of
$$f(x) = (3x^4 - x + 7)^6$$

7. (5 pts) Find the indefinite integral
$$\int (7x^4 - \sqrt[5]{x^3}) dx$$

- 8. (5 pts) Find the definite integral of $\int_{0}^{\pi/2} (2x \sin x) dx$
- 9. (5 pts) Find the indefinite integral $\int (5-3x)^6 dx$

10. (5 pts) Find the indefinite integral
$$\int \frac{\cos(\sqrt{x}) + 1}{\sqrt{x}} dx$$

Part II. Calculus II Competency.

- 11. (5 pts) Find the area the bounded in the first quadrant bounded between the graphs of $y = x^2 + 3x$ and y = 5x.
- 12. (5 pts) Find the indefinite integral $\int xe^{-3x} dx$

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

14. (5 pts) Find the indefinite integral $\int \frac{x-2}{(4x-x^2)^3} dx$

15. (5 pts) Test the series for convergence:
$$\sum_{k=1}^{\infty} \frac{k+1}{3k^2+2}$$

- 16. (5 pts) Test the series for convergence: $\sum_{k=1}^{\infty} k^3 \left(\frac{7}{9}\right)^{k^{-1}}$
- 17. (5 pts) Find the first four non-zero terms of the MacLaurin series of $f(x) = \cos(3x^2)$

Part III. Calculus III competency.

- (5 pts) Find f_x , f_y for $f(x, y) = x^2 e^{2xy}$ 18.
- 19.
- (5 pts) Find f_{xx} , f_{yx} for $f(x, y) = x^2 e^{2xy}$ (5 pts) Find f_x , f_y , f_z for $f(x, y, z) = \frac{z + \sqrt{y x}}{z^3}$ 20.