Part I. Calculus I competency.

1. (5 pts) Find the equation of the tangent line to the graph of the function $f(x) = \sin(x - \pi) \text{ at } x = \frac{3\pi}{2}$.

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 $\int (7x^4 - 3\sqrt[3]{x^3}) \, dx$.

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.

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

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

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