Final Exam
MATH 142 -CALCULUS II

There are ten questions each worth 10 points.
Carefully read the instruction at the top of each page.
This is a closed book exam - you are not permitted to use a notecard or any notes, besides the trigonometric identity sheet. If you would like extra scratch paper raise your hand. Calculators and other electronic aides are not permitted.

Good luck!

Question 1

Find a Taylor (or Maclaurin) expansion of $\frac{-2}{4+x}$. You may center the expansion at any point x_0 however I recommend using a geometric series. Find the Radius of Convergence and the Interval of Convergence. Determine if the endpoints of the interval converge, converge absolutely or diverge.

Question 2

Find the Taylor expansion of $\cos(2x)$ centered at $x_0 = \pi$. Find the Radius of Convergence and the Interval of Convergence.

Question 3

Find the length of the curve parametrized by

$$x = t^3, \quad y = 3t^2/2, \quad 0 \leq t \leq \sqrt{3}.$$

(**Hint:** You may need to use the trig substitution $t = tan\theta$ to evaluate this integral!)

Question 4

Find the degree 4 Taylor polynomial of the function $e^x \sin x$.

Question 5

Describe the parametrized curve of $x = 3t + 2$, $y = t - 1$ $(-\infty < t < \infty)$ by plotting the curve or by converting to rectangular coordinates. Find dy/dx.

Question 6

Estimate the definite integral $\int_0^1 \cos x^2 dx$ with an error of less than 0.001 using a Taylor Series. You may do as you like (as long as you justify your answer) however I recommend the following steps.

a. Write the Maclaurin Series for $\cos x$ and replace the x with x^2.

b. Integrate the above series to get a series for $\int \cos x^2 dx$.

c. Evaluate the above integral at the limits of integration and determine how many terms are needed to achieve an error of less than 0.001. (You do not need to simplify your answer.)