MATH 152 Practice Test 3 **Name:**
Student number:

Show all work. Part A. Problems 1-5, 6 points each.

1. Tell me why $\sum_{n=1}^{\infty}(-1)^n$ diverges.

2. Use a Taylor polynomial of degree 3 to give an approximation of e^2. Hint you can use the first 4 terms of the Taylor series for e^x

3. Find a Taylor series for $\frac{1}{1+2x}$ and indicate where it converges.

4. Write the first 4 k-th Partial sums of the series $\sum_{n=1}^{\infty} n$. Will the series converge or diverge?

5. Find the derivative of $y = \cos^4(x)$.

PartB 6-12 10 Points each

6. A population of mice doubles every 6 years. If the initial Population is 6400 mice write a Geometric sequence that represents the population after n years. Check it for 6 years and make sure it doubles. Approximate when it will be 3 times what it started?

7. Find the periodic payment that will amount to \$10,000 where interest is compounded annually at 8% and payments are made at the end of each year for 12 years.

8. Give the definition of a Taylor polynomial of a function $f(x)$ of degree n at 0. Find the Taylor polynomial of degree 4 at 0 for $f(x) = xe^{(3x)}$.

9. Show $S = \sum_{j=0}^{n} r^j = \dfrac{1 - r^{n+1}}{1 - r}$. Hint: Write out the terms of S and subtract rS.

10. Give the definitions of $\sin(\theta)$ and $cos(\theta)$ in terms of a right triangle with sides labeled x, y and r and then show $\cos^2(\theta) + \sin^2(\theta) = 1$. Hint: I would label the right triangle so $x^2 + y^2 = r^2$

11. Use the quotient rule to PROVE $\dfrac{d}{dx} \sec(x) = \sec(x) \tan(x)$.

12. Use the Taylor series of $f(x) = e^{x^3}$ to find $f^{(9))}(0)$.