

York University, Department of Mathematics and Statistics
Math 1014 “Applied Calculus II”, Winter 2015
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Test 3

2015-4-8

Last name

First name

Student ID

Email

Section letter

Instructions

- (a) Solve each of the 4 questions.
- (b) Write legibly. Clearly indicate where you are writing your solutions.

1. (10 pts)

(a) Show that the sum $S_n = 1 + r + r^2 + r^3 + \dots + r^{n-1} = \frac{1 - r^n}{1 - r}$.

(b) What happens to this S_n in the limit as $n \rightarrow \infty$?

(c) Suppose a patient is taking 100mg of a drug at the same time each day, and, after 24 hrs, 10% of the drug remains in their body just prior to the next dose. How much will remain just after the 3rd dose?

(d) If the patient continues taking the drug for a long time, how much drug will be present in their body just after taking each days dose.

Extra space for Question 1

2. (10 pts)

Determine whether or not each of the following series converges. Do not attempt to find the sum, but clearly explain why you think the series will converge, citing any tests that are used.

(a) $\sum_{n=1}^{\infty} \frac{n+100}{n^3+1}$ (b) $\sum_{n=2}^{\infty} \frac{(-1)^n}{n-1}$ (c) $\sum_{n=0}^{\infty} \frac{1}{(n+1)^{0.5}}$ (d) $\sum_{n=1}^{\infty} \frac{2^n}{n!}$

Extra space for Question 2

3. (10 pts)

(a) Derive the power series expansion for the function $f(x) = x^2 \tan^{-1}(x^3)$

(b) Derive the power series expansion of $\frac{1}{(1-x)^3}$.

(c) Evaluate the integral $\int \frac{t}{1+t^3} dt$ as a power series.

Extra space for Question 3

4. (10 pts)

Determine the radius, and interval (i.e., check the endpoints) of convergence of the series:

(a) $\sum_0^{\infty} \frac{x^n}{n!}$ (b) $\sum_0^{\infty} \frac{(1-x)^n}{n}$ (c) $\sum_0^{\infty} (2x+4)^n$

Extra space for Question 4

Extra space