Universidad de Puerto Rico
Departamento de Matemáticas
MATE 3018 – Repaso 5–

Apellidos: _____ _____ Nombre _____
No. Estudiante: _____ Profesor: _____ Sección _____

(1) State the Principle of Mathematical Induction

(2) Use mathematical induction to prove that $1 + 2^1 + 2^2 + \cdots + 2^{n-1} = 2^n - 1$

(3) Use mathematical induction to prove that $1 + 4 + 7 + \cdots + (3n - 2) = \dfrac{n(3n-1)}{2}$

(4) Use mathematical induction to prove that $n^2 - n + 2$ is even for every $n \in \mathbb{N}$.

(5) Find the value of $\begin{pmatrix} 10 \\ 8 \end{pmatrix} =$

(6) Write as a factorial $(200)(199)(198)(197) =$

(7) Find the expansion and simplify $(3x - 2y^2)^6 =$

(8) Write the indicated term.
   (a) The $7th$ term in the expansion of $(3x - 2)^9$

   (b) The term that contains x^7 in the expansion of $(2x - 3)^{10}$

   (c) The term that contains x^4 in the expansion of $\left(x - \dfrac{2}{\sqrt{x}}\right)^{10}$

(9) Prove that $\begin{pmatrix} n \\ k \end{pmatrix} = \begin{pmatrix} n \\ n-k \end{pmatrix}$

(10) Solve the equation $\begin{pmatrix} n \\ 2 \end{pmatrix} = 36$

(11) Express by using the Sigma notation $1 + 3 + 5 + \cdots + (2n-1) =$

(12) Define an arithmetic sequence.

(13) Define a geometric sequence

(14) Given that $t_8 = 8$ and $t_{21} = 47$ are terms of an arithmetic sequence, find t_{51}, t_n and S_{51}.

(15) How many terms of the arithmetic sequence $-10, -7, -4, \cdots$, do we have to sum to obtain 200?

(16) Find t_{10} of the geometric sequence $-1, 2, -4, \cdots$.

(17) Evaluate $\sum_{k=1}^{6} \left(\frac{2}{3}\right)^k =$

(18) Evaluate $\sum_{k=1}^{n} \left(\frac{2}{3}\right)^k =$

(19) In the series $1 + \frac{6}{5} + \frac{18}{25} + \cdots + a_n$, find an expression of a_n.

(20) Find 3 geometric means between 3 and 27.

(21) Prove that the geometric means of $a > 0$ and $b > 0$ is $\sqrt{ab}$.

(22) Find x such that $2x + 3$ is the geometric mean between x and $3x + 18$.

(23) Find x such that $2x - 7$, $5x - 9$ and $7x + 2$ are consecutive terms of an arithmetic sequence.

(24) Find x such that $x - 2$, x and $2x - 3$ are consecutive terms of a geometric sequence.