**INTRODUCTION TO MATHEMATICAL ANALYSIS**

**FACTORIALS**

|  |  |
| --- | --- |
| 1. Write in expanded form: $3!$

=$3×2×1=6$ | 1. Write in expanded form: $6!$

$$=6×5×4×3×2×1=720$$ |
| 1. Simplify: $\frac{6!}{3!}$

$=6×5×4$**= 120** | 1. Simplify: $\frac{10!}{7! ∙ 3!} $

$$=\frac{10×9×8}{6}=12$$ |
| 1. Simplify: $\frac{8!}{7!} $

$$=8$$ | 1. Simplify: $\frac{6!}{4!2!}$

$$=\frac{6×5}{2!}=15$$ |
| 1. Write in expanded form: $n!$

$$=n\left(n-1\right)\left(n-2\right)…(2)(1)$$ | 1. Write in expanded form: $\left(n+2\right)!$

$$=\left(n+2\right)\left(n+1\right)\left(n\right)\left(n-1\right)\left(n-2\right)..(2)(1)$$ |
| 1. $Simplify: \frac{n}{n!}$

$$=\frac{1}{\left(n-1\right)!}$$ | 1. $Simplify: \frac{\left(n+4\right)!}{\left(n+2\right)!}$

$$=(n+4)(n+3)$$ |
| 1. $Simplify: \frac{\left(n+1\right)!}{\left(n-2\right)!3!}$

=$\frac{\left(n+1\right)\left(n\right)\left(n-1\right)}{6}$ | 1. $Simplify: \frac{n!}{\left(n-2\right)!4!}$

$$=\frac{\left(n\right)\left(n-1\right)}{4!}=\frac{n\left(n-1\right)}{24}$$ |

**EXPANDING BINOMIALS**

Write each of the following in binomial theorem form. Don’t simplify.

|  |  |
| --- | --- |
| 1. $\left(x+y\right)^{0}$

$$=1$$ | 1. $\left(x+y\right)^{1} $

$$=x+y$$ |
| 1. $\left(3x-2y\right)^{3} $

$$=3x^{3}\left(-2y\right)^{0}+3\left(3x\right)^{1}\left(-2y\right)^{1}+3\left(3y\right)^{0}\left(-2y\right)^{2}$$ | 1. $\left(2x+y\right)^{2} $

$$=\left(2x\right)^{2}y^{0}+2\left(2x\right)^{1}y^{1}+\left(2x\right)^{0}y^{2}$$ |
| Fully expand each of the following. |
| 1. $\left(x+y\right)^{2} $

$$=x^{2}+2xy+y^{2}$$ | 1. $\left(x+y\right)^{3} $

$$=x^{3}+3x^{2}y+3xy^{2}+y^{3}$$ |
| 1. $\left(x+y\right)^{4} $

$$=x^{4}+4x^{3}y+6x^{2}y^{2}+4x^{1}y^{3}+y^{4}$$ | 1. $\left(3x-4y\right)^{4}$

$$=81x^{4}-432x^{3}y^{1}+864x^{2}y^{2}-768x^{1}y^{3}+256y^{4}$$ |
| 1. $\left(x+y\right)^{12} $

$$=x^{12}y^{0}+12x^{11}y^{1}+66x^{10}y^{2}+220x^{9}y^{3}+493x^{8}y^{4}+792x^{7}y^{5}+924x^{6}y^{6}+792x^{5}y^{7}+495x^{4}y^{8}+220x^{3}y^{9}+66x^{2}y^{10}+12x^{1}y^{11}+x^{1}y^{12}$$ |  |