

## Analysis S1 Final Exam REVIEW SHEET 4

1. Show that  $\binom{10}{1}\binom{9}{2}\binom{7}{3} = \binom{10}{4}\binom{6}{3}\binom{3}{2} = \binom{10}{2}\binom{8}{4}\binom{4}{1}$

2. Find each of the following

a)  $2\left[\binom{5}{0} + \binom{5}{1} + \binom{5}{2}\right]$

b)  $2\left[\binom{6}{0} + \binom{6}{1} + \binom{6}{2}\right] + \binom{6}{3}$

c)  $\binom{4}{0} - \binom{4}{1} + \binom{4}{2} - \binom{4}{3} + \binom{4}{4}$

d)  $\binom{100}{0} - \binom{100}{1} + \binom{100}{2} - \binom{100}{3} + \dots - \binom{100}{99} + \binom{100}{100}$

3. Find each sum.

a)  $24 + 32 + 40 + \dots + 800$

b)  $10 + 30 + 90 + \dots + 5314410$

c)  $300 - 270 + 243 - 218.7 + \dots$

d) The 30<sup>th</sup> row of Pascal's Triangle

e)  $6 - \frac{6}{2^2} + \frac{6}{2^4} - \frac{6}{2^6} + \dots + \frac{6}{2^{188}} =$

4. Write each series from the previous question in Sigma Notation.

5. What are the key identifiers of a proof by Mathematical Induction?

6. For the set: {2, 6, 18, 54}, calculate...

a) the arithmetic mean

b) the geometric mean

7. Find r and s such that  $\frac{r!}{s!} = \frac{1}{20 \cdot 19 \cdot 18 \cdot 17}$

8. What is the common difference of an arithmetic sequence whose first term is 2, and all 20 terms add to 300?

9. Find the 1<sup>st</sup>, 5<sup>th</sup>, and 10<sup>th</sup> terms of the expansion of  $(4x - 3y)^{17}$

10. Use the patterns that we found in Pascal's Triangle to write each of the following as a single term or binomial coefficient.

a)  $\binom{n}{k} + \binom{n}{k+1}$

b)  $\binom{n-1}{k-1} + \binom{n-1}{k} + \binom{n}{k+1} + \binom{n+1}{k+2}$

c)  $\binom{87}{0} + \binom{88}{1} + \binom{89}{2} + \binom{90}{3} + \dots + \binom{143}{56}$

d)  $\binom{n+10}{n+10} + \binom{n+11}{n+10} + \binom{n+12}{n+10} + \dots + \binom{n+41}{n+10}$

e)  $\binom{n+10}{0} + \binom{n+10}{2} + \binom{n+10}{4} + \dots + \binom{n+10}{n+8} + \binom{n+10}{n+10}$

11. Name the following 3 -D surfaces:

a)  $\frac{x^2}{7} - \frac{y^2}{12} = \frac{z^2}{7}$

b)  $\frac{x^2}{7} - \frac{y}{12} = \frac{z^2}{7}$

c)  $\frac{x^2}{7} = \frac{z^2}{7} + 11$

d)  $\frac{x^2}{7} = \frac{z^2}{7} + y + 11$

12. How much more money would Joe have after 10 years if he invested his \$4000 dollars (@ 4% annual interest) if his bank compounded continuously rather than monthly?

13. A population of emus doubles every 13 years. How long will it take the population to triple?

14. Joey is playing a game with a 10 sided die. If he rolls a multiple of 3 his brother gives him 1 dollar. If he rolls a prime number he has to pay his brother 3 dollars. This of course is not a fair game. Make it a fair game by creating a payout/payment for rolling a "10".

15. Write a parametric equation for an ellipse with center (8, 2) with "x radius" = 4 and "y radius" = 5. Explain what would happen if you reversed sine and cosine in your equation.

16. In our classroom we have 36 seats (9 groups of 4). I randomly assign 36 students to the seats. What is the probability you are in a group with your best friend?