

PROVE THE FOLLOWING USING THE SUMS OF POWERS OF INTEGERS  
 $n=31$

$$\textcircled{1} \sum_{n=1}^{20} n^2 + n^3$$

$$\textcircled{2} \sum_{n=0}^{30} 5n^4 - 3n$$

$$5 \left[ \frac{31(32)(63)(2975)}{30} \right] - 3 \left[ \frac{31(32)}{2} \right]$$

$$30,987,600 - 1488$$

$$30,986,112$$

DETERMINE THE LIMIT OF EACH OF THE FOLLOWING SEQUENCES

$$(3) a_n = \frac{2n+5}{3n^2+1}$$

$$\lim_{n \rightarrow \infty} a_n = 0$$

$$(4) a_n = \frac{2n+5}{3n+1}$$

$$\lim_{n \rightarrow \infty} a_n = \frac{2}{3}$$

$$(5) a_n = \frac{2n^3+5}{3n+1}$$

$$\lim_{n \rightarrow \infty} a_n = \infty$$

⑥

LIST THE FIRST FIVE TERMS OF THE SERIES.  
THEN SUBSTITUTE  $x^3$  to create another series.

$$\sum_{n=1}^{\infty} \frac{(-3)^{n-1}}{n} x^n = \frac{(-3)^{1-1}}{1} \cdot x^1 + \frac{(-3)^{2-1}}{2} \cdot x^2 + \frac{(-3)^{3-1}}{3} \cdot x^3$$
$$= x - \frac{3}{2}x^2 + 3x^3 - \frac{27}{4}x^4 + \frac{81}{5}x^5$$

$$b) x^3 - \frac{3}{2}x^6 + 3x^9 - \frac{27}{4}x^{12} + \frac{81}{5}x^{15}$$

Expand the binomial

$$(3x - 4)^5$$

$$(5 - 2z)^3 \Rightarrow (-2z + 5)^3$$

$$1(3x)^5 \quad 5(3x)^4(-4)^1 \quad 10(3x)^3(-4)^2 \quad 10(3x)^2(-4)^3 \quad 5(3x)(-4)^4 \quad 1(-4)^5$$

$$243x^5 - 1620x^4 + 4320x^3 - 5760x^2 + 3840x - 1024$$

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$$1(5)^3 \quad 3(5)^2(-2z)^1 \quad 3(5)^1(-2z)^2 \quad 1(-2z)^3$$

$$125 - 150z + 60z^2 - 8z^3$$

$$-8z^3 + 60z^2 - 150z + 125$$

Find the  $x^4y^3$  term for the given binomial  $(2x + y)^7$

$$1 \quad 7 \quad 21 \quad \boxed{35} \quad 35 \quad 21 \quad 7 \quad 1$$

$$35(2x)^4(y)^3$$

$$\underline{560x^4y^3}$$

Find the  $x^3y^2$  term for the given binomial  $(3x - y^2)^5$

$$1 \quad 5 \quad \boxed{10} \quad 10 \quad 5 \quad 1$$

$$10(3x)^3(-y^2)^2$$

$$270x^3y^4$$



$$x^2 y^2$$

$$(2x-5y)^4$$

$$1 \quad 4 \quad \boxed{6} \quad 4 \quad 1$$

$$x^6 y^3$$

$$(x+2y)^9$$

$$1 \quad 9 \quad 36 \quad \boxed{84} \quad 126 \quad 126 \quad 84 \quad 36 \quad 9 \quad 1$$

$$84(x)^4(2y)^3$$

$$672x^4y^3$$

$$\frac{3}{x+1} + \frac{2}{x+2}$$

$$\frac{5x+2}{x^2+3x+2}$$