Binomial Theorem Ex 18.1 Q8

$$3^{3n} - 26n - 1$$
$$= \left(3^3\right)^n - 26n - 1$$
$$= 27^n - 26n - 1$$
$$= (1+26)^n - 26n - 1$$
$$= \left({}^nC_0 + {}^nC_1(26)^1 + {}^nC_2(26)^2 + \ldots\ldots + {}^nC_n(26)^n\right) - 26n - 1$$
$$= \left(1 + 26n + 676\,{}^nC_2 + \ldots\ldots + 676(26)^{n-2}\right) - 26n - 1$$
$$= 676\left({}^nC_2 + \ldots\ldots + (26)^{n-2}\right)$$

$\therefore$ $3^{3n} - 26n - 1$ **is divisible for** $n \in N$**.**

Hence, proved

Binomial Theorem Ex 18.1 Q9

We have,

$$(1.1)^{10000} = (1+0.1)^{10000}$$
$$= {}^{10000}C_0 + {}^{10000}C_1(0.1) + {}^{10000}C_2(0.1)^2 + \ldots + {}^{10000}C_{10000}(0.1)^{10000}$$
$$= 1 + 10000 \times (0.1) + \text{ other positive terms}$$
$$= 1 + 1000 + \text{ other positive terms}$$
$$= 1001 + \text{ other positive terms} > 1000$$

$$\therefore \quad (1.1)^{10000} > 1000$$

Binomial Theorem Ex 18.1 Q10

$$(1.2)^{4000} = (1+0.2)^{4000}$$
$$= {}^{4000}C_0(0.2)^0(1)^{4000} + {}^{4000}C_1 \times (0.2)^1 \times 1^{3999} + \ldots\ldots\ldots + {}^{4000}C_{400}(0.2)^{4000}1^0$$
$$= 1 + 4000 \times 0.2 \times 1 + \ldots\ldots\ldots + (0.2)^{4000}$$
$$= 1 + 800 + \ldots\ldots\ldots + (0.2)^{4000}$$

Here, we clearly observe $(1,2)^{4000}$ **is** less **than** (801) **thus,** $(1.2)^{4000} < 800$**.**

Binomial Theorem Ex 18.1 Q11

$$(1.01)^{10} + (1-0.01)^{10} = (1+0.01)^{10} + (1-0.01)^{10}$$
$$= \left({}^{10}C_1 + {}^{10}C_2\frac{1}{10^2} + {}^{10}C_3\frac{1}{10^3} \ldots + {}^{10}C_{10}\frac{1}{10^{10}}\right) + \left({}^{10}C_1 - {}^{10}C_2\frac{1}{10^2} + {}^{10}C_3\frac{1}{10^3} - {}^{10}C_4\frac{1}{10^4} + \ldots\right)$$
$$= 2\left({}^{10}C_1 - {}^{10}C_3\frac{1}{10^3} + {}^{10}C_5\frac{1}{10^5} + {}^{10}C_7\frac{1}{10^7} + {}^{10}C_9\frac{1}{10^9}\right)$$
$$= 2\left(10 + \frac{10!}{3!7!}\frac{1}{1000} + \frac{10!}{5!5!}\frac{1}{(10)^5} + \frac{10!}{7!3!} \times \frac{1}{10^7} + \frac{10!}{9!1!}\frac{1}{10^9}\right)$$
$$= 2\left(10 + \frac{9 \times 8}{3 \times 2 \times 1000} + \frac{9 \times 8 \times 7 \times 6}{5 \times 4 \times 3 \times 2 \times 10^5} + \frac{9 \times 8}{3 \times 2 \times 10^7} + \frac{1}{10^8}\right)$$
$$= 2.0090042$$

Binomial Theorem Ex 18.1 Q12

$$
\begin{aligned}
2^{4n+4} - 15n - 16 &= 2^{4(n+1)} - 15n - 15 - 1 \\
&= (16)^{(n+1)} - 15(n+1) - 1 \\
&= (1+15)^{n+1} - 15(n+1) - 1 \\
&= \left[{}^{n+1}C_0 + {}^{n+1}C_1(15) + {}^{n+1}C_2(15)^2 + \ldots\ldots + {}^{n+1}C_{n+1}(15)^{n+1} \right] - 15(n+1) - 1 \\
&= \left[1 + 15(n+1) + {}^{n+1}C_2(15)^2 + \ldots\ldots + {}^{n+1}C_{n+1}(15)^{n+1} \right] - 15(n+1) - 1 \\
&= 225\left[{}^{n+1}C_2 + \ldots\ldots + {}^{n+1}C_{n+1}(15)^{n-1} \right] \\
&= 225 \times \text{natural number}
\end{aligned}
$$

*********** END **********