

Find each product.

1) $4x^2(3x^2 + 1)$

Answer: $12x^4 + 4x^2$

2) $-9x(x^2 + 2x + 4)$

Answer: $-9x^3 - 18x^2 - 36x$

3) $-6x^2(x^3 + 7x^2 - 4x + 3)$

Answer: $-6x^5 - 42x^4 + 24x^3 - 18x^2$

4) $x^3(-4x^3 + 10x^2 - 7x + 2)$

Answer: $-4x^6 + 10x^5 - 7x^4 + 2x^3$

5) $(x + 2)(y^2 + 2y - 12)$

Answer: $xy^2 + 2xy - 12x + 2y^2 + 4y - 24$

6) $(p + q)(4p^2 - p - 8q^2 - q)$

Answer: $4p^3 - p^2 + 4p^2q - 2pq - 8pq^2 - q^2 - 8q^3$

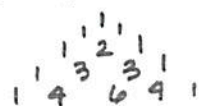
Expand each expression.

7) $(3x - 1)^3$

$1 (3x)^3 (-1)^0 = (1)(3)^3(x)^3(1) = 27x^3$
 $3 (3x)^2 (-1)^1 = (3)(3)^2(x)^2(-1) = (3)(9)(x)^2(-1) = -27x^2$
 $3 (3x)^1 (-1)^2 = (3)(3)^1(x)^1(-1)^2 = 9x(1) = 9x$
 $1 (3x)^0 (-1)^3 = (1)(3)^0(x)^0(-1)^3 = (1)(1)(1)(-1) = -1$

Answer: $27x^3 - 27x^2 + 9x - 1$

8) $(x - 4)^4$



$1 (x)^4 (-4)^0 = 1x^4(1) = x^4$
 $4 (x)^3 (-4)^1 = 4x^3(-4) = -16x^3$
 $6 (x)^2 (-4)^2 = 6x^2(16) = 96x^2$
 $4 (x)^1 (-4)^3 = 4x(-64) = -256x$
 $1 (x)^0 (-4)^4 = (1)(1)(256) = 256$

Answer: $x^4 - 16x^3 + 96x^2 - 256x + 256$

9) $3(a - 4b)^2$

10) $5(x^2 - 2y^3)^3$

Answer: $3a^2 - 24ab + 48b^2$

Answer: $5x^6 - 30x^4y + 60x^2y^2 - 40y^3$

11) A biologist has found that the number of branches on a certain rare tree in its first few years of life can be modeled by the polynomial $b(y) = 4y^2 + y$. The number of leaves on each branch can be modeled by the polynomial $l(y) = 2y^3 + 3y^2 + y$, where y is the number of years after the tree reaches a height of 6 feet. Write a polynomial describing the total number of leaves on the tree.

Answer: $8y^5 + 14y^4 + 7y^3 + y^2$