

1. (a)

$$\begin{aligned}(x + y)^4 &= \binom{4}{0}x^4y^0 + \binom{4}{1}x^3y^1 + \binom{4}{2}x^2y^2 + \binom{4}{3}x^1y^3 + \binom{4}{4}x^0y^4 \\ &= \boxed{x^4 + 4x^3y + 6x^2y^2 + 4xy^3 + y^4}\end{aligned}$$

(b)

$$\begin{aligned}(x^2 - y)^4 &= \binom{4}{0}(x^2)^4(-y)^0 + \binom{4}{1}(x^2)^3(-y)^1 + \binom{4}{2}(x^2)^2(-y)^2 + \binom{4}{3}(x^2)x^1(-y)^3 + \binom{4}{4}(x^2)x^0(-y)^4 \\ &= \boxed{x^8 - 4x^6y + 6x^4y^2 - 4x^2y^3 + y^4}\end{aligned}$$

2. $\boxed{20}$

3. (a) $\binom{20}{4} = \boxed{4845}$ (b) $\binom{15}{5} = \boxed{3003}$

(c) $\binom{14}{3}(2x)^3(-y)^1 = 364 \cdot 8x^3 \cdot -y^1 = -2912x^3y^1$. $\boxed{-2912}$

4. $\boxed{d = \binom{9}{4} = 126, n = 9}$

5. $\boxed{64}$

6. $\boxed{0}$

7. $\boxed{2^{99}}$

8. $\boxed{7}$

9. $\boxed{\binom{10}{5}}$

10. $\boxed{\binom{200}{100}}$