

# Zero and Negative Exponents Notes

## Definition for Negative and Zero Exponents

$$a^0 = 1, a \neq 0$$

$$a^{-n} = \frac{1}{a^n} \text{ for any integer, } a \neq 0$$

**Sample Problem 1:** simplify the following expression.

$$1. \quad -4^0 - 2^2 = -5$$

$$3. \quad -2^{-4} - \frac{1}{2x^0} = -\frac{1}{16} - \frac{1}{2} = -\frac{9}{16}$$

$$2. \quad -2x^0 = -2$$

$$4. \quad (-x^0 - 1^{-1})^{-1} = (-1 - 1)^{-1} = -2^{-1} = -\frac{1}{2}$$

**Sample Problem 2:** Evaluate the following using properties of powers.

$$5. \quad \left(\frac{-5}{4}\right)^{-3} \\ = \left(-\frac{4}{5}\right)^3 = -\frac{64}{125}$$

$$7. \quad \left[\frac{-(2x)^0}{2x^0}\right]^{-3} \\ = \left[\frac{-1}{2}\right]^{-3} = -2^3 = -8$$

$$6. \quad \left(\frac{2x}{3y^4}\right)^{-1} \\ = \left(\frac{3y^4}{2x}\right)^1 = \frac{3y^4}{2x}$$

$$8. \quad (-2)^{-3} \\ = -2^{-3} = -\frac{1}{2^3} = -\frac{1}{8}$$

**Sample 3:** Simplify the following without negative exponent.

$$9. \quad \frac{2^{-1} - 3^{-1}}{2^{-1} + 3^{-1}} = \frac{\frac{1}{2} - \frac{1}{3}}{\frac{1}{2} + \frac{1}{3}} = \frac{\frac{3-2}{6}}{\frac{3+2}{6}} = \frac{1}{5} = \frac{1}{6} \cdot \frac{6}{5} = \frac{6}{30} \text{ or } \frac{1}{5}$$

$$10. \quad -2^{-1} - (-2^2)^0 = -\frac{1}{2} - \left(-\frac{1}{4}\right)^0 = -\frac{1}{2} - 1 = -\frac{3}{2}$$