**Simplifying Exponential Expressions**

**Example 1**

A microorganism’s ability to survive is proportional to its surface area to volume ratio. The shape of many microorganisms can be approximated by a sphere. Determine the ratio of the surface area of a sphere to its volume. Which microorganisms have a greater chance of survival? Large or small?

$$Microorganism^{'}s Survival Ability\~\frac{Surface area of sphere}{Volume of sphere}$$

**Example 2**

Evaluate the expression $\frac{x^{2y-3}x^{y+1}}{x^{y-4}} $when $x = -2$ and $y = 1$.

Method 1 Method 2

**Example 3**

Simplify the expression $\frac{(3x^{-1}y^{2})^{3}}{(2x^{2}y^{-1})^{2}}$

**Example 4**

Simplify the expression $\frac{(8x^{6}y^{-3})^{\frac{1}{3}}}{(16x^{4}y^{-2})^{\frac{1}{2}}}$

**Example 5**

Simplify the expression $\left(\frac{\sqrt[3]{x^{2}}}{\sqrt{x^{5}}}\right)^{4}$