ARC 190
Worksheet 4

1. Simplify:
   (a) \(\frac{x^3 y^2}{x y}\)
   (b) \(\frac{x^{4/5}}{x^{1/3}}\)
   (c) \(\frac{(x^2 y^4)^3}{x^3 y^3}\)
   (d) \(\frac{\sqrt{x^2 y^3}}{x^{1/3} y^{-2}}\)

2. Evaluate each of the following:
   (a) \((\sqrt[3]{64})^2\)
   (b) \(\sqrt[3]{32}\)
   (c) \(81^{3/4}\)
   (d) \(\sqrt[3]{27^{2/3}}\)
3. Express the following numbers in scientific notation, rounded to three digits:

(a) 3,936,432.567  
(b) 0.0000457

(c) 367 million  
(d) 1,235 trillion

4. Compute the following. Express the answer in scientific notation, rounded to three digits.

(a) $(3.52 \times 10^4) \times (4.61 \times 10^3)$  
(b) $(-6.41 \times 10^7) \times (-5.98 \times 10^{-5})$

(c) $\frac{7.89 \times 10^8}{4.78 \times 10^2}$  
(d) $(3.58 \times 10^{-5})^4$

(e) $\sqrt{3.61 \times 10^{-22}}$  
(f) $\sqrt{4.75 \times 10^{23}}$
5. Solve the following equations:

(a) \( x^{-2} = \frac{1}{4} \)  
(b) \( x^{3/2} = 27 \)

(c) \( x^{-1/2} = 3 \)  
(d) \( \frac{9}{\sqrt{x^3}} = \frac{1}{\sqrt{x}} \)

6. Find all solutions to the following equations:

(a) \( x^4 - 7x^2 + 12 = 0 \)  
(\text{Hint: First, let } a = x^2, \text{ and solve for } a.)

(b) \( x^{2/5} - 5x^{1/5} + 6 = 0 \)  
(\text{Hint: First, let } a = x^{1/5}, \text{ and solve for } a.)
7. Suppose that $f(x) = x^2 + 3x$ and $g(x) = \sqrt{x}$.
   (a) What is $f(g(x))$?

   (b) What is $g(f(x))$?

8. For each of the following functions $h(x)$, find functions $f(x)$ and $g(x)$ so that $f(g(x)) = h(x)$

   (a) $h(x) = \sqrt{x^2 + 1}$

   (b) $h(x) = \sin(3x^2)$