1. Simplify:
   (a) $\sqrt{x^4y^{-8}}$  
   (b) $(x^3y^5)^4$

   (c) $\frac{x^{5/3}}{\sqrt{x}}$  
   (d) $\sqrt[3]{\frac{x^3y^4}{x^2y^{-1}}}$

2. Compute the following without using a calculator:
   (a) $5^0$  
   (b) $64^{2/3}$

   (c) $3^{-2}$  
   (d) $49^{-1/2}$
3. Express the following numbers in scientific notation, rounded to three digits:
   
   (a) $1,325,000$  
   (b) $0.003$  
   (c) $13.5$ trillion  
   (d) $0.000087$  

4. Compute the following. Express the answer in scientific notation, rounded to three digits.
   
   (a) $(1.5 \times 10^{-4}) \times (2.6 \times 10^7)$  
   (b) $(4.89 \times 10^8) \times (6.7 \times 10^{-3})$  
   (c) $\frac{2.89 \times 10^5}{3.71 \times 10^{-3}}$  
   (d) $(5.1 \times 10^6)^4$  
   (e) $\sqrt{5.81 \times 10^{18}}$  
   (f) $\sqrt[3]{8.4 \times 10^{27}}$
5. The Earth is 4.6 billion years old. Determine the age of the Earth in seconds. Express your answer in scientific notation.

6. The speed of light is $3 \times 10^8$ meters/second. If the sun is $1.5 \times 10^{11}$ meters from earth, how long does it take light to reach the earth. Give your answer in minutes.

7. One carbon atom weighs $1.9926 \times 10^{-23}$ grams. How many carbon atoms are in 1 gram of carbon? Express your answer in scientific notation.
8. Solve the following equations:
   (a) \( \sqrt{x^2 - 2x} = 2 \)
   
   (b) \( 2x(4 - x)^{-1/2} - 3\sqrt{4 - x} = 0 \)

9. For each of the following equations, state whether the equation is true or false.
   (a) \((x + y)^2 = x^2 + y^2\)
   (b) \(\sqrt{xy} = \sqrt{x} \sqrt{y}\)
   
   (c) \(\sqrt{x^2 + y^2} = x + y\)
   (d) \(\frac{1}{x + y} = \frac{1}{x} + \frac{1}{y}\)
10. Suppose that $f(x) = 3x^2 + x$ and $g(x) = \frac{2}{x}$.

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

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

(c) What is $f(f(x))$?

(d) What is $g(g(x))$?
11. For each of the following functions $h(x)$, find functions $f(x)$ and $g(x)$ so that

$$f(g(x)) = h(x)$$

(a) $h(x) = \sqrt{3x + 4}$

(b) $h(x) = \frac{1}{2x^2 + 4x}$

(c) $h(x) = e^{3x - 1}$