1. The period $p$ of a planet whose average distance from the sun is $d$ million miles is given by $p = kd^{3/2}$, where $k$ is a constant. The average distance from the earth to the sun is 93 million miles. The number of days in a year is 365.

(a) The period of Jupiter is 4320 earth days. At what average distance from the sun is Jupiter?

(b) The average distance of Mars from the sun is 141 million miles. What is the period of Mars?
2. The swimming speed $U$ (in cm/sec) of a salmon is proportional to the square root of its length (in cm).

(a) Find a formula that relates the swimming speed of the salmon to its length.

(b) If a 2 cm long salmon swims with a speed of 27.578 cm/sec and a 5 cm long salmon swims with a speed of 43.603 cm/sec, find the value of $k$.

(c) If one salmon is 6 times the length of another salmon, how are their swimming speeds related?
3. Simplify each of the following. (Appendix A)

(a) \( \left( \frac{M^{\frac{1}{5}}}{3N^{-\frac{1}{2}}} \right)^2 \)

(b) \( \frac{3u^2 \sqrt{uw}}{w^{\frac{3}{4}}} \)

(c) \( p^{\sqrt{2}} \times p^{\sqrt{3}} \)

(d) \( \frac{f^{2y}g^{y}}{f^{3y}} \)
(e) \[ \frac{4A^{-3}}{(2A)^{-4}} \]

(f) \[ (a^{-1} + b^{-1})^{-1} \]

(g) \[ \frac{(0.1x^2y^3)^4(xy^4)^{-3}}{x^2y} \]
4. A power function is of the form:

\[ y = kx^p, \]

where \( k \) is the constant of proportionality and \( p \) is a real number. For each of the following functions determine whether it is a power function. In the case it is a power function, determine the values of \( k \) and \( p \).

(a) \( P(x) = x^n \sqrt{\frac{\pi}{3x}} \)

(b) \( Q(x) = 27 - 9x - 3 \left( \frac{1}{2}x - 3 \right)^2 \)

(c) \( G(x) = \frac{\sqrt{5} \cdot x^{2/3} \cdot 8x}{2^{3x-1}} - \frac{4x \cdot 2^{x+2} \cdot x^{5/3}}{2^{3x} \cdot x} \)

(d) \( E(x) = x^{11/2} \sqrt{\frac{\pi}{3x}} + \frac{\sqrt{2} (x \cdot 4^x)^5}{2^{10x}} \)