1) Write each expression with base 2.

a) 4^6 **b)** 8^3 **c)** $\left(\frac{1}{8}\right)^2$ **d)** 14

2) Write each expression as a power of 4.

a) $\left(\sqrt{16}\right)^3$ **b)** $\sqrt[3]{16}$ **c)** $\sqrt{64} \times \left(\sqrt[4]{128}\right)^3$

3) Solve each equation

a) $2^{4x} = 4^{x+3}$ **b)** $3^{w+1} = 9^{w-1}$ **c)** $4^{3x} = 8^{x-3}$ **d)** $125^{2y-1} = 25^{y+4}$

4) Consider the equation $10^{2x} = 100^{2x-5}$

a) Solve this equation by expressing both sides as powers of a common base.

b) Solve the same equation by taking the common logarithm of both sides.

5) Solve $2^{3x} > 4^{x+1}$

6) Solve for t. Round answers to 2 decimal places.

a) $2 = 1.07^t$ **b)** $100 = 10(1.04)^t$ **c)** $15 = \left(\dfrac{1}{2}\right)^{\frac{t}{4}}$

7) Solve each equation. Round answers to 3 decimal places.

a) $2^x = 3^{x-1}$

b) $5^{x-2} = 4^x$

c) $7^{2x+1} = 4^{x-2}$

8) Solve $2^{2x} + 2^x - 6 = 0$ using the quadratic formula (or by factoring). Clearly identify any extraneous roots.

9) Solve $8^{2x} - 2(8^x) - 5 = 0$ using the quadratic formula. Clearly identify any extraneous roots.

10) Use the decay equation for polonium-218, $A(t) = A_0 \left(\frac{1}{2}\right)^{\frac{t}{3.1}}$, A is the amount remaining after t minutes and A_0 is the initial amount.

a) How much will remain after 90 seconds from an initial sample of 50 mg?

b) How long will it take for this sample to decay to 10% of its initial amount of 50 mg?

11) A 20-mg sample of thorium-233 decays to 17 mg after 5 minutes.

a) What is the half-life of thorium-233?

b) How long will it take this sample to decay to 1 mg?