62, 21, 48, 51, 50
1, 5, 17, 18

① $Q = 7e^{-10t} \longleftrightarrow Q = ab^t$

implies $e^{-10} = b$ and $7 = a$

so $4.54\times10^{-5} \approx b$

$\therefore \boxed{Q = 7(4.54\times10^{-5})^t}$

5 $Q = 4(8)^{1.3t} \longleftrightarrow Q = ae^{kt}$

implies $a = 4$

$8^{1.3} = e^k$

$\ln 8^{1.3} = \ln e^k$

$1.3\ln 8 = k$

$2.703 \approx k$

$\boxed{Q = 4e^{2.703t}}$

17 $3^{4\log x} = 5$

$\log 3^{4\log x} = \log 5$

$4\log x \log 3 = \log 5$

$4\log x = \frac{\log 5}{\log 3}$

$\log x = \frac{1}{4}\left(\frac{\log 5}{\log 3}\right)$

$10^{\log x} = 10^{\frac{1}{4}\left(\frac{\log 5}{\log 3}\right)}$

$x = 10^{\frac{1}{4}\left(\frac{\log 5}{\log 3}\right)}$

$\approx \boxed{2.324}$

18

$100^{2x+3} = \sqrt[3]{10{,}000}$

$10^{2(2x+3)} = (10^4)^{1/3}$

$10^{4x+6} = 10^{4/3}$

$\log 10^{4x+6} = \log 10^{4/3}$

$4x+6 = \frac{4}{3}$

$4x = -\frac{14}{3}$

$\boxed{x = -\frac{7}{6}}$

21 $\frac{\log x^2 + \log x^3}{\log(100x)} = 3$

$\frac{2\log x + 3\log x}{\log(100) + \log x} = 3$

$\frac{5\log x}{2 + \log x} = 3$

$5\log x = 6 + 3\log x$

$2\log x = 6$

$\log x = 3$

$10^{\log x} = 10^3$

$\boxed{x = 1{,}000}$

48, 50, 51, 62

48 a $B(t) = 5000(1.06)^t$ $\quad B(t) = 5000\, e^{kt}$

For these to model the same phenomena.

$$e^k = 1.06$$
$$\ln e^k = \ln 1.06$$
$$k = \ln 1.06 \approx 0.05827$$

5.827% <u>continuous</u> growth.

b $B(t) = 7500\, e^{0.072t}$ $\rightarrow$ 7.2% continuous growth.

$B(t) = 7500\, b^t$ implies $b = e^{0.072} \approx 1.07466$

~~B(t)~~

, which corresponds to an effective annual growth rate of 7.466%.

50 $R = 50(1.029)^t$ (Erehwon)

a $C = 45(1.032)^t$ (Ecalpon)

b when does $R = C$

$$50(1.029)^t = 45(1.032)^t$$
$$(1.029)^t = \frac{9}{10}(1.032)^t$$
$$\left(\frac{1.029}{1.032}\right)^t = \frac{9}{10}$$
$$\log\left(\frac{1.029}{1.032}\right)^t = \log\frac{9}{10}$$
$$t \log\left(\frac{1.029}{1.032}\right) = \log\frac{9}{10}$$
$$t = \frac{\log\frac{9}{10}}{\log\left(\frac{1.029}{1.032}\right)} \approx \frac{-0.04576}{-0.001264} \approx \boxed{36.19 \text{ years}}$$

c $C = 2R$

$$45(1.032)^t = 100(1.029)^t \rightarrow \frac{9}{20} = \left(\frac{1.029}{1.032}\right)^t \rightarrow t = \frac{\log\frac{9}{20}}{\log\left(\frac{1.029}{1.032}\right)} \approx \boxed{274.29 \text{ years}}$$

51 $P(t) = 5(2)^{t/7}$

a 7 years. $P(7) = 5(2)^{7/7} = 5(2) = 10$ double of 5!

b $P(t) = a b^t$ $a = 5$ $b = 2^{1/7} \approx 1.10409 \rightarrow 10.409\%$ annual growth.

62 a $h(n) = 6(0.90)^n$

b $h(12) = 6(0.90)^{12} \approx 1.695$ ft

c 1 inch $= \frac{1}{12}$ ft. $\rightarrow$ $\frac{1}{12} = 6(0.90)^n$

$$\frac{1}{72} = (0.90)^n$$

$$\log \frac{1}{72} = n \log(0.90)$$

$$\frac{\log \frac{1}{72}}{\log(0.90)} = n$$

$$\frac{-1.8573}{-0.04575} \approx n$$

$$\boxed{40.59 \approx n \text{ bounces.}}$$