1.5

19 $f(x) = -(x-2)^2, \; x \le 2$

$x = -(y-2)^2$

$\pm\sqrt{-x} = \sqrt{(y-2)^2}$

$\pm\sqrt{-x} = y-2$

$2 \pm \sqrt{-x} = y$

$2 - \sqrt{-x} = y$ (for $y \le 2$)

$f(f^{-1}(x)) = -([\cancel{2}-\sqrt{-x}]-\cancel{2})^2$

$= -(-\sqrt{-x})^2$

$= -(-x)$

$= x$

$f^{-1}(f(x)) = 2 - \sqrt{+[+(x-2)^2]}$

$= 2 - \sqrt{(x-2)^2}$

$= 2 - |x-2|$

$= 2-(x-2)$ or $2--(x-2)$

$\cancel{-x+2}$ $\quad x$

44 $f(x) = \frac{50}{1+1.1^{-x}}$

$x = \frac{50}{1+1.1^{-y}}$

$1+1.1^{-y} = \frac{50}{x}$

$-1 \qquad -1$

$1.1^{-y} = \frac{50}{x} - 1$

$\log_{1.1} 1.1^{-y} = \log_{1.1}\left[\frac{50}{x} - 1\right]$

$-y = \log_{1.1}\left[\frac{50}{x} - 1\right]$

$y = -\log_{1.1}\left[\frac{50}{x} - 1\right]$

1.5

44 cont. $\log_{1.1} 1.1^{-y} = \log_{1.1}\left[\frac{50}{x} - 1\right]$

$-y = \log_{1.1}\left[\frac{50}{x} - 1\right]$

$y = -\log_{1.1}\left[\frac{50}{x} - 1\right]$

✓ $f(f^{-1}(x)) = \frac{50}{1 + 1.1^{+\log_{1.1}\left[\frac{50}{x} - 1\right]}}$

$= \frac{50}{\cancel{1} + \frac{50}{x} \cancel{-1}}$

$= \frac{\cancel{50}}{1} \cdot \frac{x}{\cancel{50}} = x$

✓ $f^{-1}(f(x)) = -\log_{1.1}\left[\frac{50}{\left[\frac{50}{1+1.1^{-x}}\right]} - 1\right]$

$\frac{\cancel{50}}{1} \cdot \frac{1+1.1^{-x}}{\cancel{50}}$

$-\log_{1.1}\left[\cancel{1} + 1.1^{-x} \cancel{-1}\right]$

$-\log_{1.1}\left[1.1^{-x}\right]$

$- -x = x$

1.5

43| $f(x) = \frac{100}{1+2^{-x}}$

$x = \frac{100}{1+2^{-y}}$

$\cancel{1}+2^{-y} = \frac{100}{x} - 1$

-1

$\log_2 2^{-y} = \log_2\left[\frac{100}{x} - 1\right]$

$-y = \log_2\left[\frac{100}{x} - 1\right]$

$f^{-1}(x) = -\log_2\left[\frac{100}{x} - 1\right]$

$f(f^{-1}(x)) = \frac{100}{1+2^{+\log_2\left[\frac{100}{x}-1\right]}}$

$= \frac{100}{\cancel{1}+\left[\frac{100}{x}-\cancel{1}\right]}$

$= \frac{\cancel{100}}{1} \cdot \frac{x}{\cancel{100}} = x$

$f^{-1}(f(x)) = -\log_2\left[\frac{100}{\frac{100}{1+2^{-x}}} - 1\right]$

$= -\log_2\left[\cancel{1}+2^{-x}-\cancel{1}\right]$

$= -\log_2 2^{-x}$

$= -(-x) = x$

1.5

34| $e^{0.05t} = 3$

$\ln e^{0.05t} = \ln 3$

$\frac{.05t}{.05} = \frac{\ln 3}{.05} = 20\ln 3$

$\frac{1}{20} = .05$

35| $e^{x} + e^{-x} = 3$

$x^2 - 3x + 1$

$\frac{e^x}{e^x} e^x + \frac{1}{e^x} = 3$

$x = 3\pm$

$\cancel{e^x}\,\frac{e^{2x}+1}{\cancel{e^x}} = 3 \cdot e^x$

$e^{2x} + 1 = 3e^x$

$-3e^x \quad -3e^x$

$e^{2x} - 3e^x + 1 = 0$

$a = 1$

$b = -3$ $\quad \ln e^x = \ln \frac{3 \pm \sqrt{9-4}}{2}$ $\quad \ln\left[\frac{3 \pm \sqrt{5}}{2}\right]$

$c = 1$

1.5

46| $A = 8\left(\frac{1}{2}\right)^{t/12}$

$$\frac{1}{8} = \frac{8\left(\frac{1}{2}\right)^{t/12}}{8}$$

$$\frac{1}{8} = \frac{1}{2}^{t/12}$$

$$\ln\left(\frac{1}{8}\right) = \ln\left(\frac{1}{2}\right)^{t/12}$$

$$12 \cdot \frac{\ln\left(\frac{1}{8}\right)}{\ln\left(\frac{1}{2}\right)} = \frac{\frac{t}{\cancel{12}}\cancel{\left(\ln\frac{1}{2}\right)}}{\cancel{\left(\ln\frac{1}{2}\right)}} \cdot \cancel{12}$$

$$\approx 36$$

$$\log_{\frac{1}{2}} \frac{1}{8} = \log_{\frac{1}{2}} \left(\frac{1}{2}\right)^{t/12}$$

$$\log_{\frac{1}{2}} \left(\frac{1}{8}\right) = t/12$$

$$12 \cdot 3 = t/\cancel{12} \cdot \cancel{12}$$

$$36 = t$$