Hammack 5.1

(16) $\left(\frac{4}{9}\right)^{-\frac{1}{2}} = \frac{1}{\left(\frac{4}{9}\right)^{\frac{1}{2}}} = \frac{1}{\sqrt{\frac{4}{9}}} = \frac{1}{\frac{2}{3}} = \boxed{\frac{3}{2}}$

Hammack 5.3

(4) $\log_3\left(\frac{1}{\sqrt{3}}\right) = \log_3\left(\frac{1}{3^{1/2}}\right) = \log_3\left(3^{-1/2}\right) = 3^{\square}\left(3^{-\frac{1}{2}}\right) = \boxed{-\frac{1}{2}}$

(16) $\log_2\left(2^{\sin(x)}\right) = 2^{\square}\left(2^{\sin(x)}\right) = \boxed{\sin(x)}$

Hammack 5.4

(2) $\log_2(\sin(x)) + \frac{1}{2}\log_2(4x) - 3\log_2(3)$

$= \log_2(\sin(x)) + \log_2\left((4x)^{\frac{1}{2}}\right) - \log_2(3^3)$

$= \log_2(\sin(x)) + \log_2(2\sqrt{x}) - \log_2(27)$

$= \log_2(\sin(x)\,2\sqrt{x}) - \log_2(27) = \log_2\left(\frac{2\sqrt{x}\,\sin(x)}{27}\right)$

(12) $\log_2(2) - \log_2(5x) + \log_2(20x)$

$= \log_2\left(\frac{2}{5x}\right) + \log_2(20x) = \log_2\left(\frac{2}{5x}\cdot 20x\right) = \log_2(8) = \boxed{3}$

(16) $g(z) = 2^{1/z}$ Find $g^{-1}(z)$

$y = 2^{1/z}$

$z = 2^{1/y}$

$\log_2(z) = \log_2\left(2^{\frac{1}{y}}\right)$

$\log_2(z) = \frac{1}{y}$

$y = \frac{1}{\log_2(z)}$

$\boxed{g^{-1}(z) = \frac{1}{\log_2(z)}}$

Alternate approach

$y = 2^{\frac{1}{z}}$

$z = 2^{\frac{1}{y}}$

$\ln(z) = \ln\left(2^{\frac{1}{y}}\right)$

$\ln(z) = \frac{1}{y}\ln(2)$

$y = \frac{\ln(2)}{\ln(z)}$

$\boxed{g^{-1}(z) = \frac{\ln(2)}{\ln(z)}}$

Hammack 5.5

(2) $2\ln(7e) - \ln(49) = \ln((7e)^2) - \ln(49)$

$= \ln(49e^2) - \ln(49)$

$= \ln(49) + \ln(e^2) - \ln(49)$

$= \ln(e^2) = \boxed{2}$

(8) Solve $10^{4x-2} = 11$

$\ln(10^{4x-2}) = \ln(11)$

$(4x-2)\ln(10) = \ln(11)$

$4x\ln(10) - 2\ln(10) = \ln(11)$

$4x\ln(10) = \ln(11) + 2\ln(10)$

$$x = \frac{\ln(11) + 2\ln(10)}{4\ln(10)}$$

$$x = \frac{\ln(11) + \ln(10^2)}{4\ln(10)} =$$

$$x = \frac{\ln(11) + \ln(100)}{4\ln(10)} = \boxed{\frac{\ln(1100)}{4\ln(10)}} \approx \boxed{0.7603}$$

(20) $\log(9) = \log_{10}(9) = \dfrac{\ln(9)}{\ln(10)} \approx \boxed{0.95424209}$

Change of base formula

Check: $\log_{10}(9) = 0.95424209\ldots$ means $10^{0.95424029\ldots} = 9$

and indeed a calculator confirms this.