

$$21 - 9e^{10a-8} - 5 = -41$$

$$-9e^{10a-8} = -36$$

$$e^{10a-8} = 4$$

$$10a - 8 = \ln(4)$$

$$10a - 8 = 2\ln(2)$$

$$10a = 8 + 2\ln(2)$$

$$a = \frac{8 + 2\ln(2)}{10}$$

$$a = \frac{4 + \ln(2)}{5}$$

$$28. D = 10 \log \left(\frac{I}{10^{-12}} \right)$$

$$I = 4.7 \times 10^{-1} \text{ W/m}^2$$

$$\begin{aligned} D &= 10 \log \left(\frac{4.7 \times 10^{-1}}{10^{-12}} \right) \\ &= 10 \log (4.7 \times 10^{11}) \\ &= 116.721 \text{ dB} \end{aligned}$$

Problem 1

$$\cancel{EI = \log_2(f \cdot t)} \quad EI = \log_2 \left(\frac{f^2}{t} \right)$$

$$\begin{aligned} f &= 8 \\ t &= 2 \end{aligned}$$

$$\begin{aligned} EI &= \log_2 \left(\frac{8^2}{2} \right) = \log_2 \left(\frac{64}{2} \right) \\ &= \log_2 (32) \\ &= \log_2 (2^5) \\ &= 5 \log_2 2 \\ &= 5 \end{aligned}$$

Problem 2

$$EI = -2, t = 16$$

$$-2 = \log_2 \left(\frac{f^2}{16} \right)$$

$$\begin{aligned} -2 \log_2 2 &= \log_2 \left(\frac{f^2}{16} \right) \\ \log_2 (2^{-2}) &= \log_2 \left(\frac{f^2}{16} \right) \end{aligned}$$

$$\frac{1}{4} = \frac{f^2}{16}$$

$$f^2 = \frac{16}{4} = 4$$

$$f^2 = 4$$

$$f = 2$$

Problem 3

$$\log \left(\frac{I_1}{I_2} \right) = M_1 - M_2$$

$$M_1 = 9.0$$

$$M_2 = 6.1$$

$$\log \left(\frac{I_1}{I_2} \right) = 9.0 - 6.1$$

$$\log \left(\frac{I_1}{I_2} \right) = 2.9$$

Problem 3

$$\log \left(\frac{I_1}{I_2} \right) = M_1 - M_2$$

$$M_1 = 9.0 \quad M_2 = 6.1$$

$$\log \left(\frac{I_1}{I_2} \right) = 9.0 - 6.1$$

$$\log \left(\frac{I_1}{I_2} \right) = 9.0 - 6.1 = 2.9$$

$$\log \left(\frac{I_1}{I_2} \right) = 2.9 \log 10$$

$$\log \left(\frac{I_1}{I_2} \right) = \log 10^{2.9}$$

$$\frac{I_1}{I_2} = 10^{2.9}$$

$$\begin{aligned} \frac{I_1}{I_2} &= 794.33 \\ &= 794 \end{aligned}$$

The 2011 earthquake was 794 times greater than that of 2009.

Problem 4

$$y = A e^{kt}$$

$$e^{kt} = \frac{y}{A}$$

$$\ln(e^{kt}) = \ln\left(\frac{y}{A}\right)$$

$$kt = \ln\left(\frac{y}{A}\right)$$

$$t = \frac{1}{k} \ln\left(\frac{y}{A}\right)$$