

Math 1A Fall 2001: Section 3.7 Solutions

$$2. f(x) = \ln(x^2 + 10) \Rightarrow f'(x) = \frac{1}{x^2 + 10} \frac{d}{dx}(x^2 + 10) = \frac{2x}{x^2 + 10}$$

$$4. f(x) = \cos(\ln x) \Rightarrow f'(x) = -\sin(\ln x) \cdot \frac{1}{x} = \frac{-\sin(\ln x)}{x}$$

$$6. f(x) = \log_{10}\left(\frac{x}{x-1}\right) = \log_{10} x - \log_{10}(x-1) \Rightarrow f'(x) = \frac{1}{x \ln 10} - \frac{1}{(x-1) \ln 10} \text{ or } -\frac{1}{x(x-1) \ln 10}$$

$$14. y = \ln(x^4 \sin^2 x) = \ln x^4 + \ln(\sin x)^2 = 4 \ln x + 2 \ln \sin x \Rightarrow y' = 4 \cdot \frac{1}{x} + 2 \cdot \frac{1}{\sin x} \cdot \cos x = \frac{4}{x} + 2 \cot x$$

$$18. y = [\ln(1 + e^x)]^2 \Rightarrow y' = 2[\ln(1 + e^x)] \cdot \frac{1}{1 + e^x} \cdot e^x = \frac{2e^x \ln(1 + e^x)}{1 + e^x}$$

$$22. f(x) = \ln \ln \ln x \Rightarrow f'(x) = \frac{1}{\ln \ln x} \cdot \frac{1}{\ln x} \cdot \frac{1}{x}$$

$$\text{Dom}(f) = \{x \mid \ln \ln x > 0\} = \{x \mid \ln x > 1\} = \{x \mid x > e\} = (e, \infty).$$

$$32. y = x^{1/x} \Rightarrow \ln y = \frac{1}{x} \ln x \Rightarrow \frac{y'}{y} = \frac{1}{x} \left(\frac{1}{x}\right) + (\ln x) \left(-\frac{1}{x^2}\right) \Rightarrow y' = x^{1/x} \frac{1 - \ln x}{x^2}$$

$$36. y = x^{\ln x} \Rightarrow \ln y = \ln x \ln x = (\ln x)^2 \Rightarrow \frac{y'}{y} = 2 \ln x \left(\frac{1}{x}\right) \Rightarrow y' = x^{\ln x} \left(\frac{2 \ln x}{x}\right)$$