II. Exponentials and Logarithms: Calculus

1c)

$$\frac{d}{dx} e^{-x^2} = e^{-x^2} \cdot \frac{d}{dx} -x^2 = \boxed{-2e^{-x^2}x}$$

1d)

$$\frac{d}{dx}(x\ln x - x) = 1 \cdot \ln x + x \cdot \frac{1}{x} - 1 = \boxed{\ln x}$$

1e)

$$\frac{d}{dx} \ln x^2 = \frac{1}{x^2} \cdot 2x = \boxed{\frac{2}{x}}$$

1f)

$$\frac{d}{dx}(\ln x)^2 = (2\ln x) \cdot \frac{1}{x} = \boxed{\frac{2\ln x}{x}}$$

1m)

$$\frac{d}{dx}\left(\frac{1-e^x}{1+e^x}\right) = \frac{-e^x(1+e^x) - e^x(1-e^x)}{(1+e^x)^2} = \boxed{\frac{-2e^x}{(1+e^x)^2}}$$

4a)

$$\lim_{n\to\infty}\left(1+\frac{1}{n}\right)^{3n} = e^3$$