1. $f(x) = \dfrac{1}{1+\exp(-x)}$

$$f'(x) = \frac{1}{1+\exp(-x)'} = \frac{1}{1+(e^{-x})'} = \frac{1}{1+\left(\frac{1}{e}\right)^{x\prime}}$$

$$= \frac{1}{1+\left(\frac{1}{e}\right)^{x}} = \frac{1}{1+e^{x}}$$

2. $f(x_1, x_2) = x_1^2 + 2x_2$

$x_1 = \sin t$

$x_2 = \cos t$

$f(x_1, x_2) = (\sin t)^2 + 2(\cos t)$

$f'(x_1, x_2) = (\cos t)^2 + -2\sin t$

$(\cos t)^2 - 2\sin t$

3 $a = x^2$

$b = e^{x^2}$

$c = x^2 + e^{x^2}$

$d = \sqrt{x^2 + e^{x^2}}$

$e = \cos(x^2 + e^{x^2})$

$f = \sqrt{x^2 + e^{x^2}} + \cos(x^2 + e^{x^2})$

$$\frac{\partial a}{\partial x} = 2x$$

$$\frac{\partial b}{\partial a} = e^{x^2}$$

$$\frac{\partial c}{\partial a} = 1 + e^{x^2}$$

$$\frac{\partial d}{\partial c} = \frac{1}{2\sqrt{x^2 + e^{x^2}}}$$

$$\frac{\partial e}{\partial c} = -\sin(x^2 + e^{x^2})$$

$$\frac{\partial f}{\partial d} = 1 - 2\sqrt{x^2 + e^{x^2}} \cdot \sin(x^2 + e^{x^2})$$

$$\frac{\partial f}{\partial c} = \frac{1}{2\sqrt{x^2 + e^{x^2}}} - \sin(x^2 + e^{x^2})$$

$$\frac{\partial f}{\partial b} = \left\{\sqrt{x^2 + e^{x^2}} + \cos(x^2 + e^{x^2})\right\}\left\{\frac{1}{2\sqrt{x^2 + e^{x^2}}} - \sin(x^2 + e^{x^2})\right\}$$

$$\frac{\partial f}{\partial a} = (1 + e^{x^2})\left(\frac{1}{2\sqrt{x^2 + e^{x^2}}} - \sin(x^2 + e^{x^2})\right)$$

$$\frac{\partial f}{\partial x} = 2x(e^{x^2} + 1)\left(-\sin(e^{x^2} + x^2) + \frac{1}{2\sqrt{e^{x^2} + x^2}}\right)$$