(3) a. $y = \frac{e^{2x}}{\sqrt{x}}$

$$\frac{dy}{dx} = \frac{\sqrt{x}\cdot e^{2x}\cdot 2 - e^{2x}\cdot \frac{1}{2}x^{-1/2}}{(\sqrt{x})^2}$$

$$= \frac{2e^{2x}\sqrt{x} - \frac{e^{2x}}{2\sqrt{x}}}{x}$$

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

$$\boxed{\frac{dy}{dx} = \frac{e^{2x}}{2x\sqrt{x}}(4x-1)}$$

b. $y = \frac{1-x^2}{e^x}$

$$\frac{dy}{dx} = \frac{e^x(-2x) - (1-x^2)(e^x)}{(e^x)^2}$$

$$= \frac{-2x - 1 + x^2}{e^x}$$

$$\boxed{\frac{dy}{dx} = \frac{x^2 - 2x - 1}{e^x}}$$

c. $y = \frac{e^{3x}}{1+x}$

$$\frac{dy}{dx} = \frac{(1+x)(e^{3x})(3) - (e^{3x})}{(1+x)^2}$$

$$= \frac{e^{3x}(3x+3-1)}{(1+x)^2}$$

$$\boxed{\frac{dy}{dx} = \frac{e^{3x}(3x+2)}{(x+1)^2}}$$

d. $y = \frac{1+e^x}{1-e^x}$

$$\frac{dy}{dx} = \frac{(1-e^x)(e^x) - (1+e^x)(-e^x)}{(1-e^x)^2}$$

$$= \frac{e^x(1-e^x+1+e^x)}{(1-e^x)^2}$$

$$\boxed{\frac{dy}{dx} = \frac{2e^x}{(1-e^x)^2}}$$

(4) a. $y = \frac{xe^x}{1+e^x}$

$$\frac{dy}{dx} = \frac{(1+e^x)(e^x + xe^x) - (xe^x)(e^x)}{(1+e^x)^2}$$

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

$$= \frac{e^x\left(1 + x + e^x + \cancel{xe^x} - \cancel{xe^x}\right)}{(1+e^x)^2}$$

$$= \frac{e^x(1+x+e^x)}{(1+e^x)^2}$$