Nr. 1) a) $f(x) = \frac{x-3}{x^2+4} = 0 \Rightarrow x-3=0 \Rightarrow \underline{\underline{x_1 = 3}}$; $3^2+4 \neq 0$ $\Rightarrow \underline{\underline{\mathbb{L} = \{3\}}}$

b) $f(x) = (x-1{,}5)\cdot(9{,}1+x) = 0 \Rightarrow \underline{\underline{x_1 = 1{,}5}} \vee \underline{\underline{x_2 = -9{,}1}}$

c) $f(x) = \frac{x\cdot(x+2)}{1+x^2} = 0 \Rightarrow \underline{\underline{x_1 = 0}} \vee \underline{\underline{x_2 = -2}}$

Für x_1 und x_2 ist $1+x^2 \neq 0$

d) $f(x) = \frac{\ln(x)}{x} = 0 \Rightarrow \ln(x) = 0 \mid e\uparrow \Rightarrow \underline{\underline{x_1 = e^0 = 1}}$

e) $f(x) = (4-x^2)\cdot(2+x^2) = 0$

$4-x^2 = (2-x)(2+x) = 0 \Rightarrow \underline{\underline{x_1 = 2}} \vee \underline{\underline{x_2 = -2}}$

$2+x^2 \neq 0$ Für alle $x \in \mathbb{R}$

f) $f(x) = (e^x-1)\cdot(e^x-e) = 0 \Rightarrow e^x = 1 \mid \ln \Rightarrow \underline{\underline{x_1 = \ln(1) = 0}}$

$e^x - e = 0 \Rightarrow e^x = e \mid \ln \Rightarrow \underline{\underline{x_2 = \ln(e^1) = 1}}$

Nr. 2) a) $f(x) = e^x\cdot x^3 - e^x = 0 = \underbrace{e^x}_{\neq 0}(x^3-1) \Rightarrow \underline{\underline{x_1 = \sqrt[3]{1} = 1}}$

b) $f(x) = \frac{x^2-2}{e^x-1} = 0 \Rightarrow x^2 = 2 \Rightarrow \underline{x_{1,2} = \pm\sqrt{2}}$

Für $x_{1,2}$ ist Nenner $\neq 0$

c) $f(x) = e^{3x} - 1 = 0 \Rightarrow e^{3x} = 1 \mid \ln \Rightarrow 3x = \ln(1) = 0 \Rightarrow \underline{\underline{x_1 = 0}}$

d) $f(x) = x\cdot e^{2x} + x^2\cdot e^{2x} = x\cdot\underbrace{e^{2x}}_{\neq 0}\cdot(1+x) = 0 \Rightarrow \underline{\underline{x_1 = 0}} \vee \underline{\underline{x_2 = -1}}$

e) $f(x) = \frac{e^x - e^{2x}}{x} = 0 \Rightarrow \underbrace{e^x}_{\neq 0}\cdot(1-e^x) = 0 \Rightarrow e^x = 1 \mid \ln \Rightarrow \underline{\underline{x_1 = \ln(1) = 0}}$

Für $x_1 = 0$ wird der Nenner auch $0 \Rightarrow \underline{\underline{\mathbb{L} = \{\ \}}}$

f) $f(x) = e^{4x} - 11e^{2x} + 18 = 0 \mid$ Sub: $e^{2x} = u$

$u^2 - 11u + 18 = 0 \Rightarrow u_{1,2} = \frac{11 \pm \sqrt{11^2 - 4\cdot 1\cdot 18}}{2\cdot 1} \Rightarrow u_1 = 9 \vee u_2 = 2$

Rück. Sub: $e^{2x} = 9 \mid \ln$

$2x = \ln(9) \mid :2$

$x_1 = \frac{1}{2}\ln(9) = \ln(9^{\frac{1}{2}}) = \underline{\underline{\ln(3)}}$

$e^{2x} = 2 \mid \ln$

$2x = \ln(2) \mid :2$

$\underline{\underline{x_2 = \frac{1}{2}\ln(2)}}$

O. Fell