Aufgabe 1:

a) $f(x) = -4e^{-3x}$
$f'(x) = 12e^{-3x}$
$f''(x) = -36e^{-3x}$

b) $f(x) = -e^{-x}$
$f'(x) = e^{-x}$
$f''(x) = -e^{-x}$

c) $f(x) = 3e^{5x}$
$f'(x) = 15e^{5x}$
$f''(x) = 75e^{5x}$

d) $f(x) = 5e^{-2x}$
$f'(x) = -10e^{-2x}$
$f''(x) = 20e^{-2x}$

e) $f(x) = -5e^{-3x}$
$f'(x) = 15e^{-3x}$
$f''(x) = -45e^{-3x}$

f) $f(x) = -5e^{x}$
$f'(x) = -5e^{x}$
$f''(x) = -5e^{x}$

Aufgabe 2:

a) $f(x) = e^{-4x}$
$f'(x) = -4e^{-4x}$
$f''(x) = 16e^{-4x}$

b) $f(x) = -5e^{2x}$
$f'(x) = -10e^{2x}$
$f''(x) = -20e^{2x}$

c) $f(x) = -3e^{-2x}$
$f'(x) = 6e^{-2x}$
$f''(x) = -12e^{-2x}$

d) $f(x) = -2e^{-5x^2}$
$f'(x) = 20xe^{-5x^2}$
$f''(x) = 20\left(-10x^2 + 1\right)e^{-5x^2}$

e) $f(x) = 2e^{-5x^4}$
$f'(x) = -40x^3 e^{-5x^4}$
$f''(x) = 40x^2\left(20x^4 - 3\right)e^{-5x^4}$

f) $f(x) = -5e^{-3x^3}$
$f'(x) = 45x^2 e^{-3x^3}$
$f''(x) = 45x\left(-9x^3 + 2\right)e^{-3x^3}$

Aufgabe 3:

a) $f(x) = -x^2 e^{3x^4}$
$f'(x) = -12x^5 e^{3x^4} - 2xe^{3x^4}$
$f'(x) = -2x\left(6x^4 + 1\right)e^{3x^4}$
$f''(x) = -2\left(72x^8 + 42x^4 + 1\right)e^{3x^4}$

b) $f(x) = x^2 e^{x^4}$
$f'(x) = 4x^5 e^{x^4} + 2xe^{x^4}$
$f'(x) = 2x\left(2x^4 + 1\right)e^{x^4}$
$f''(x) = 2\left(8x^8 + 14x^4 + 1\right)e^{x^4}$

c) $f(x) = -4x^3 e^{-5x^3}$
$f'(x) = 60x^5 e^{-5x^3} - 12x^2 e^{-5x^3}$
$f'(x) = x^2\left(60x^3 - 12\right)e^{-5x^3}$
$f''(x) = 12x\left(-75x^6 + 40x^3 - 2\right)e^{-5x^3}$

d) $f(x) = 2x^2 e^{4x^4}$
$f'(x) = 32x^5 e^{4x^4} + 4xe^{4x^4}$
$f'(x) = 4x\left(8x^4 + 1\right)e^{4x^4}$
$f''(x) = 4\left(128x^8 + 56x^4 + 1\right)e^{4x^4}$

e) $f(x) = x^2 e^{-x^2}$
$f'(x) = -2x^3 e^{-x^2} + 2xe^{-x^2}$
$f'(x) = 2x\left(-x^2 + 1\right)e^{-x^2}$
$f''(x) = 2\left(2x^4 - 5x^2 + 1\right)e^{-x^2}$

f) $f(x) = -4x^3 e^{-x^4}$
$f'(x) = 16x^6 e^{-x^4} - 12x^2 e^{-x^4}$
$f'(x) = x^2\left(16x^4 - 12\right)e^{-x^4}$
$f''(x) = 8x\left(-8x^8 + 18x^4 - 3\right)e^{-x^4}$