

Opgave 1 (25 POINT)

- (a) $y_h(x) = e^{-2x}(c_1 \sin(2x) + c_2 \cos(2x))$
- (b) $y_p(x) = e^{-2x} \sin(4x)$
- (c) $y_g = y_h + y_p$
- (d) $y_0(x) = e^{-2x}(\sin(2x) + \cos(2x) + \sin(4x))$
- (e)
- (f) $x \in \mathbb{R}$
- (g) $a_0(g) = a_4(g) = 0, b_4(g) = 1.$

Opgave 2 (25 POINT)

- (a) $a^2 = c^2$
- (b) $b = \frac{1}{c^2}$
- (c)
- (d) $f_{a,b}(x) = f(ax)$
- (e) Det kræver, at $b < 0$, og dermed $t \in (-\infty, 0]$
- (f) $x \in \mathbb{R}, t \in (-\infty, 0]$
- (g) $u_t = -c^2 u_{xx}$

Opgave 3 (25 POINT)

- (a) $y_1 = -0.3289365, k_1 = -0.3203935, k_2 = -0.3106104, k_3 = -0.3093738$ og $k_4 = -0.2974057$
- (b) -0.465051
- (c) $y_{10} = -0.3612513, k_1 = 0.19276775, k_2 = 0.08199856, k_3 = 0.1035451, k_4 = -0.0002805$
- (d) $\frac{1}{15}(-0.3612513 - (-0.3691997))$
- (e) $y_5 = -1.33592787$
- (f) $\frac{1}{15} = (-1.33592787 - (-1.3375816))$
- (g) $\tilde{y}_6 = -1.410598566$
- (h) $\tilde{y}_{10} = -0.418025897$ og $y_{10} = -0.349951156$

Opgave 4 (25 POINT)

(a)

(b) $xy''(x) - 3y'(x) + 3x^{-1}y(x) = 0$

(c) $x^2y''(x) - 3xy'(x) + 3y(x) = 0, y_1(x) = x^1, y_2(x) = x^3.$

(d) $2x^3$

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

(f) $-x\frac{1}{2} \int \frac{\log(x)}{x^2} dx + \frac{1}{2}x^3 \int \frac{\log(x)}{x^4} dx = \frac{4}{9} + \frac{\log(x)}{3}$

(g) $c_1x + c_2x^3 + \frac{4}{9} + \frac{\log(x)}{3}$

(h) $\frac{2x}{9e} + \frac{4}{9} + \frac{\log(x)}{3}$