Afleveringsopgave 1

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Opgave 1

Beregn $(4+2i)^2, |4+2i|^2, \frac{(3i-3)^2}{i}, \frac{(i-1)}{i}(1+i)$

$$(4+2i)^2 = (4+2i)(4+2i) = 12+16i$$

Opgave 1a

$|z| = zz^*$

$$(4+2i)(4-2i) = 16-4i^2 = 20$$

Opgave 1b

$$\frac{(3i-3)^2}{i} = -i(3i-3)^2 = -i((3i-3)(3i-3)) = -i(9i^2-9i-9i+9) = -i(-18) = -18$$

Opgave 1c

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

Opgave 2a

$$\frac{a}{x} = \frac{b}{c} \Rightarrow \frac{1}{x} = \frac{b}{ac} \Rightarrow x = \frac{ac}{b}$$

Opgave 2b

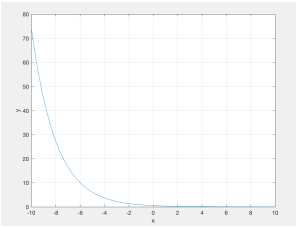
$$\frac{a}{x} + \frac{b}{c} = 1 \Rightarrow \frac{a}{x} = 1 - \frac{b}{c} \Rightarrow a = (1 - \frac{b}{c})x \Rightarrow \frac{a}{1 - \frac{b}{c}} = x$$

Opgave 3

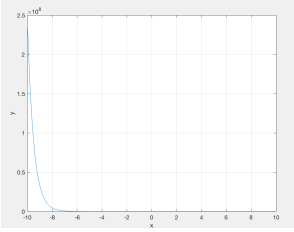
$$f(x) = sin(\alpha x)sin(kx)$$

$$f'(x) = \alpha cos(\alpha x)sin(kx) + sin(\alpha x)kcos(kx)$$

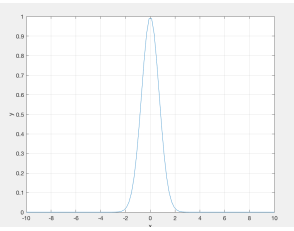
Opgave 4



Figur 1: $\frac{1}{2}e^{-\frac{x}{2}}$



Figur 2: $\frac{1}{2}e^{-2x}$



Figur 3: e^{-x^2}

Opgave 5a

$$\int_0^\infty e^{-\frac{x}{10}} dx$$

$$\int e^{-\frac{x}{10}} dx = -10e^{-\frac{x}{10}}$$

$$\int_0^\infty e^{-\frac{x}{10}} dx = -10 \cdot 0 - (-10) \cdot e^0 = 10$$

Opgave 5b

$$\int_0^{\pi} sin(x)dx$$

$$\int sin(x)dx = -cos(x)dx$$

$$\int_0^{\pi} sin(x)dx = -cos(\pi) - (-cos(x)) = 2$$

Opgave 6

$$f(x) = Asin(kx) + Bcos(kx)$$

$$f'(x) = Akcos(kx) - Bksin(kx)$$

$$f''(x) = -Ak^2 sin(kx) - Bk^2 cos(kx)$$

$$-k^2 \cdot f(x) = -Ak^2 sin(kx) - Bk^2 cos(kx)$$

$f''(x)$ og $-k^2 \cdot f(x)$ er lig hinanden og funktionen er løsning.