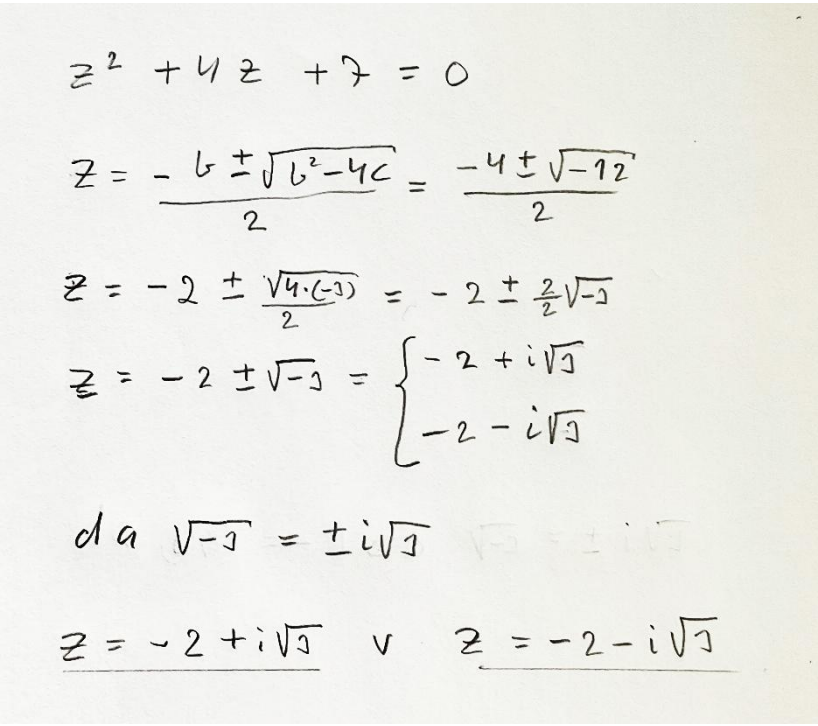
Opgavesæt 1, X opgaver – Løsnings forslag

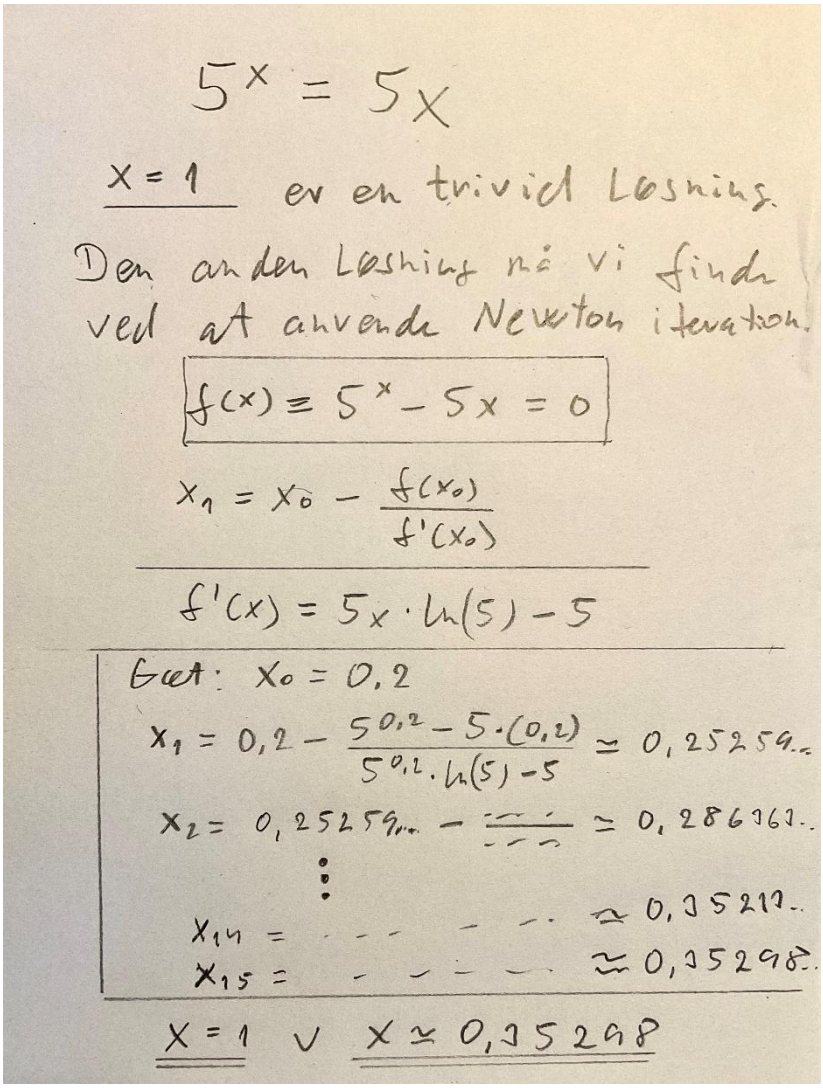
Opg X1, løsningsforslag

$$z^2 + 4z + 7 = 0 \ , \quad z \in C$$

Find rødderne i andengradsligningen.



Opg X2, løsningsforslag



Opg X3, løsningsforslag

$$5^x = -125$$

$e^{\pi i} = -1$, da $e^{\pi i} = \cos(\pi) + i\sin(\pi) = -1$

Generelt: $e^{\pi i(2k+1)} = -1$, $k \in \mathbb{Z}$

$$-125 = e^{\pi i} \cdot 125 = 125 \cdot e^{\pi i}$$

$$5^x = 125 \cdot e^{\pi i}$$

$$x \ln(5) = \ln(125) + \pi i$$

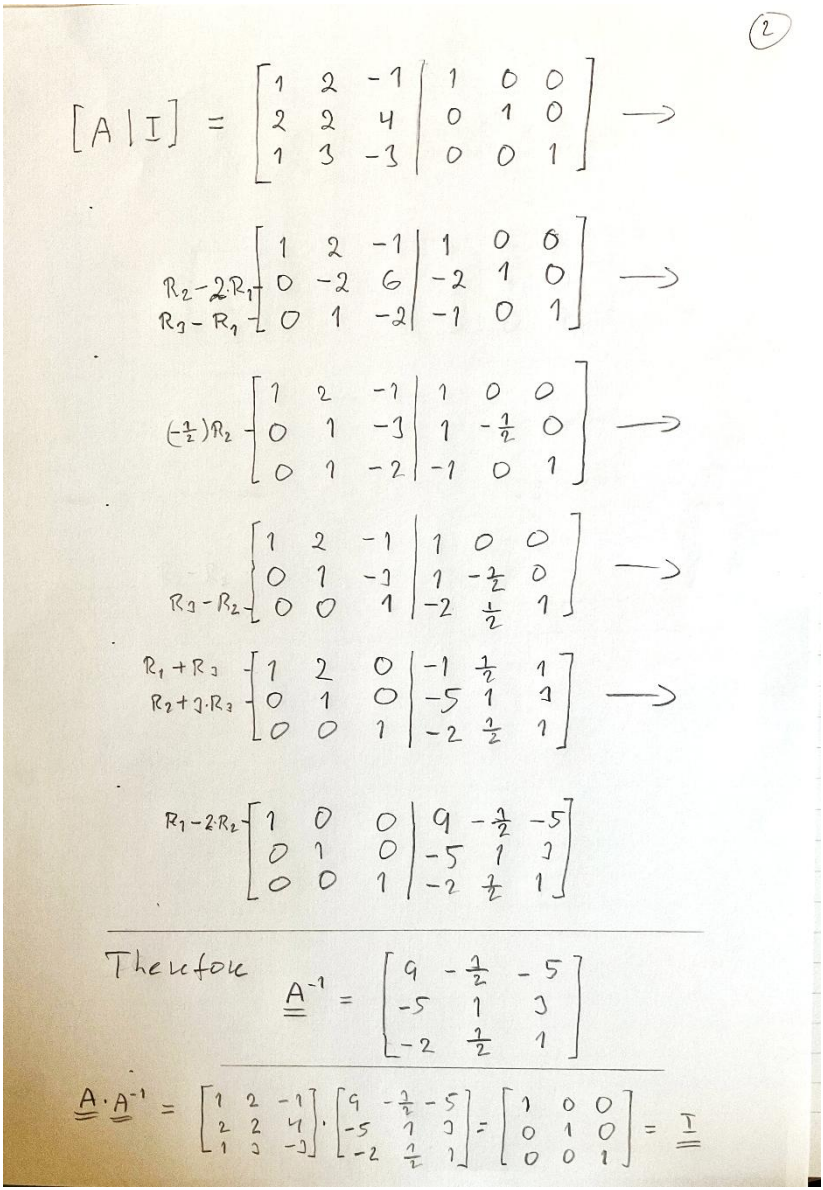
$$x \ln(5) = 3\ln(5) + \pi i$$

$$\boxed{x = 3 + \frac{\pi i}{\ln(5)}}$$

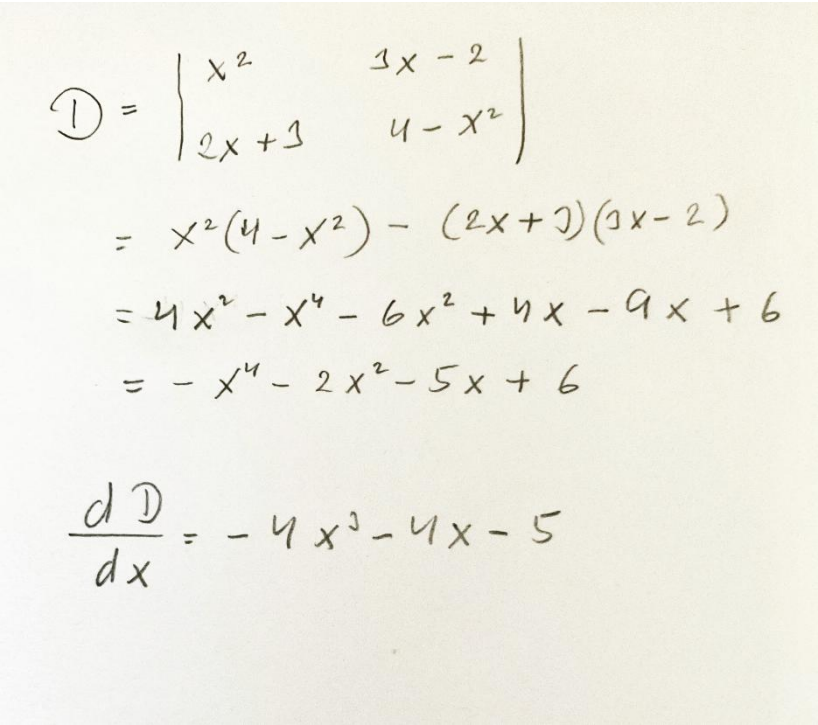
$$x \simeq 3{,}000 + 1{,}95198 \cdot i$$

eller $x = 3 + \frac{\pi i(2k+1)}{\ln(5)}$, $k \in \mathbb{Z}$

Opg X4, løsningsforslag



Opg X5, løsningsforslag



Opg X6, løsningsforslag

$$\frac{dy}{dx} - y = e^x$$

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

Dette udtryk, på venstre side af =, er netop differentialkvot. af produktet $(y \cdot e^{-x})$

$$\frac{d(y \cdot e^{-x})}{dx} = 1$$

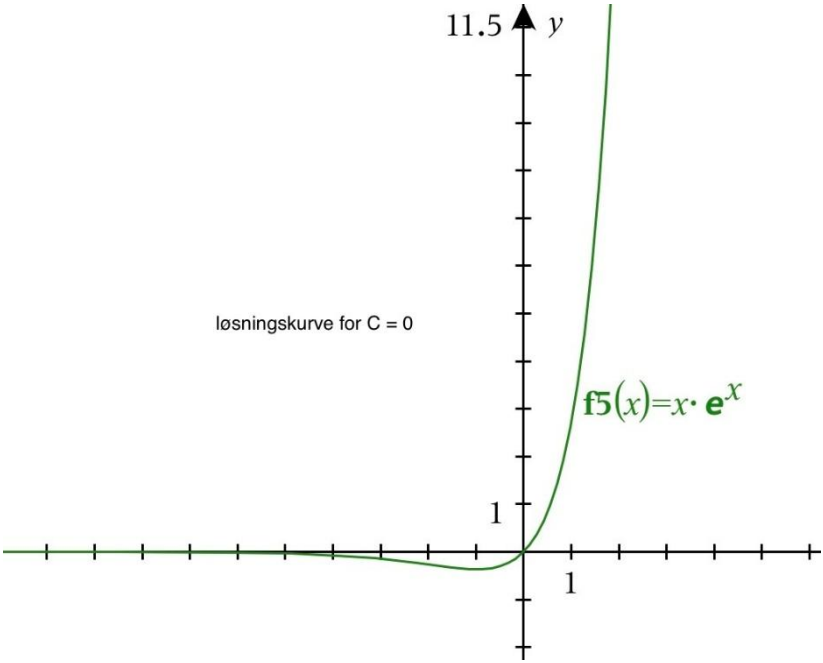
$$\int d(y \cdot e^{-x}) = \int 1 \cdot dx$$

$$y \cdot e^{-x} = x + C$$

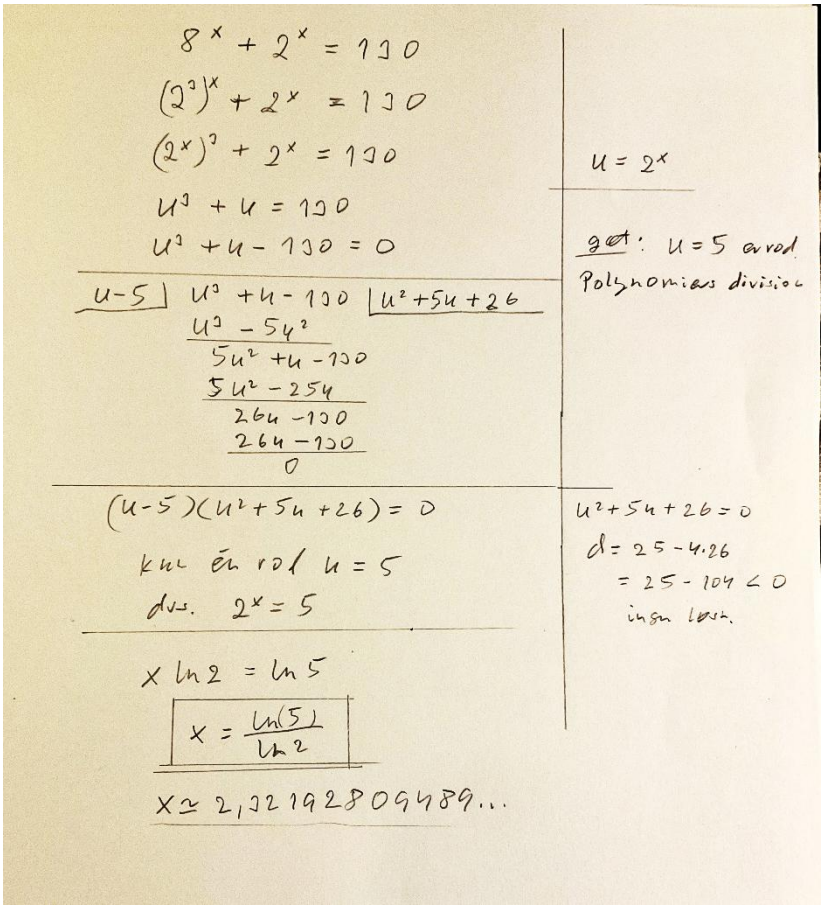
$$y = x e^x + C \cdot e^x$$

$$\boxed{y = e^x(x + C)}$$

Opg X6, løsningsforslag, tillæg graf



Opg X7, løsningsforslag



$8^x + 2^x = 130$

$(2^3)^x + 2^x = 130$

$(2^x)^3 + 2^x = 130$

$u = 2^x$

$u^3 + u = 130$

$u^3 + u - 130 = 0$

gæt: $u = 5$ er rod

Polynomiers division

$u-5 \mid u^3 + u - 130 \mid u^2 + 5u + 26$

$u^3 - 5u^2$

$5u^2 + u - 130$

$5u^2 - 25u$

$26u - 130$

$26u - 130$

0

$(u-5)(u^2+5u+26) = 0$

$u^2 + 5u + 26 = 0$

$d = 25 - 4 \cdot 26$

$= 25 - 104 < 0$

ingen løsn.

kun én rod $u = 5$

dvs. $2^x = 5$

$x \ln 2 = \ln 5$

$$x = \frac{\ln 5}{\ln 2}$$

$x \approx 2{,}321928094887\ldots$