$-4 = \sqrt{-4} \cdot \sqrt{-4} = i2 \cdot i2$

(3) $x^2+2x+2=0$

$x = \frac{-2 \pm \sqrt{2^2 - 4 \cdot 1 \cdot 2}}{2 \cdot 1} = \frac{-2 \pm \sqrt{-4}}{2} = \frac{-2}{2} \pm \frac{2i}{2} = -1 \pm i$

$p(x) = (x - 1 - i)(x + \cancel{1} + i)$

(4) $z = 2+3i$

$w = 4+5i$

$z + w = 2+3i + 4+5i = \underline{6+8i}$

$z - w = 2+3i - (4+5i) = -2-2i$

$z \cdot w = (2+3i)(4+5i) = 8 + 10i + 12i + 15i^2 = \underline{-7+22i}$

$\frac{z}{w} = \frac{2+3i}{4+5i} = \frac{(2+3i)}{(4+5i)} \cdot \frac{4-5i}{4-5i} = \frac{8-10i+12i-15i^2}{16-\cancel{20i}+\cancel{20i}-25i^2} = \frac{23+2i}{41} = \frac{23}{41} + \frac{2}{41}i$

$z^2 = (2+3i)(2+3i) = 4+12i-9 = -5+12i$

$\overline{z+w} = \overline{2+3i+4+5i} = \overline{6+8i} = \underline{6-8i}$

$\bar{z} + \bar{w} = 2-3i + 4-5i = \underline{6-8i}$

$\overline{z-w} = \overline{2+3i-4-5i} = \overline{-2-2i} = -2+2i$

$\bar{z} - \bar{w} = 2-3i-(4-5i) = 2-3i-4+5i = -2+2i$

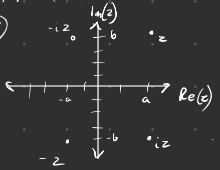
$z + \bar{z} = a+\cancel{bi}+a-\cancel{bi} = 2a$

$z - \bar{z} = a+bi-(a-bi) = \cancel{a}+bi-\cancel{a}+bi = \underline{2bi}$

(5) $\frac{1}{z} = \frac{\bar{z}}{|z|^2}$

$\frac{\bar{z}}{|z|^2} = \frac{\bar{z}}{(\sqrt{z\bar{z}})^2} = \frac{\cancel{\bar{z}}}{z\cancel{\bar{z}}} = \frac{1}{z}$

(8)



$z = a+bi$

$iz = ai - b$

$-z = -a-bi$

$-iz = -ai+b$

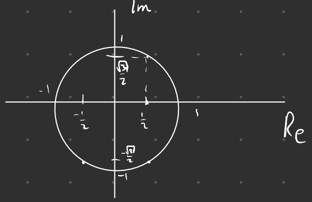
$r = \sqrt{\frac{1}{2}^2 + \frac{\sqrt{3}}{2}^2} = \sqrt{\frac{1}{4}+\frac{3}{4}} = 1$

$z = 1+\sqrt{3i} \quad z/|z| \quad (z/|z|)^k$

(9) $z = 1+\sqrt{3}i \Rightarrow \frac{1+3i}{\sqrt{1^2+\sqrt{3}^2}} = \frac{1+\sqrt{3}i}{\sqrt{4}} = \frac{1+\sqrt{3}i}{2} = \frac{1}{2} + \frac{\sqrt{3}}{2}i \Rightarrow \tan\theta = \frac{\frac{\sqrt{3}}{2}}{\frac{1}{2}} \Rightarrow \tan\theta = \sqrt{3}$

$\theta = \frac{\pi}{3}$

$v = \frac{\pi}{3}k$



euler $\Rightarrow \left(1 \cdot e^{i\frac{\pi}{3}}\right)^k = e^{i\frac{\pi}{3}k}$

polar $\Rightarrow \left(\cos\frac{\pi}{3} + i\sin\frac{\pi}{3}\right)^k$

$e^{0 \cdot k} = 1$

$e^{\frac{\pi}{3}i} = \cos\frac{\pi}{3} + i\sin\left(\frac{\pi}{3}\right) = \frac{1}{2} + i\frac{\sqrt{3}}{2}$

$e^{\frac{2\pi}{3}} = \cos\frac{2\pi}{3} + i\sin\left(\frac{2\pi}{3}\right) = -\frac{1}{2} + i\frac{\sqrt{3}}{2}$

$e^{\frac{3\pi}{3}} = -1 + i \cdot 0$

$e^{\frac{4}{3}\pi} = -\frac{1}{2} - \frac{\sqrt{3}}{2}i$

$e^{\frac{5}{3}\pi} = \frac{1}{2} - \frac{\sqrt{3}}{2}i$

$e^{2\pi} = 1 + 0i$

$z = \frac{1}{2} + \frac{\sqrt{3}}{2} i$ $\qquad z^k = \left(\frac{1}{2} + \frac{\sqrt{3}}{2} i\right)^k$

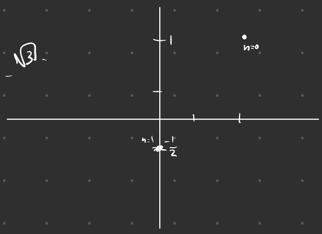
$w = 1+i$ $\qquad |z| = \sqrt{\left(\frac{1}{2} + \frac{\sqrt{3}}{2}\right)^2} = 1$

$e^{i\frac{\pi}{3}k}(1+i) \rightarrow$

$e^{i\frac{\pi}{3}0}(1+i) = 1+i$

$e^{i\frac{\pi}{3}}(1+i) = e^{i\frac{\pi}{3}} + i e^{i\frac{\pi}{3}} = \left(\frac{1}{2} + \frac{\sqrt{3}}{2} i\right) + \left(\frac{1}{2} i - \frac{\sqrt{3}}{2}\right) = \frac{1}{2} + \frac{\sqrt{3}}{2} i + \frac{1}{2} i - \frac{\sqrt{3}}{2} = \frac{\sqrt{3}+1}{2} i - \sqrt{3} -$

$e^{i\frac{2\pi}{3}}(1+i) = e^{i\frac{2\pi}{3}} + i e^{i\frac{2\pi}{3}} = \left(\frac{1}{2} - \frac{\sqrt{3}}{2} i\right) + \left(\frac{1}{2} i + \frac{\sqrt{3}}{2}\right) =$



(6) $f(x) = e^x$

Bilde $f: \mathbb{R} \to [0, \infty)$

$g(x) = \ln x$

Bilde $g: (0, \infty) \to (-\infty, \infty)$

(7) $f(y) = y \sin y$

$f(0) = 0$

$f\left(\frac{\pi}{2}\right) = \frac{\pi}{2}$

$f(\pi) = 0$

$f\left(\frac{3\pi}{2}\right) = -\frac{3\pi}{2}$

(8) $\int \frac{\ln(\ln(x))}{x} dx$ $\qquad u = \ln(x)$, $u' = \frac{1}{x}$ $\qquad u' = 1$, $v = \ln u$, $u = u$, $v' = \frac{1}{u}$

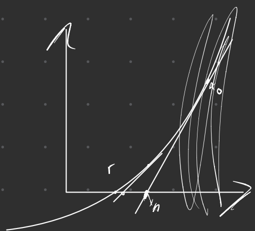
$\int \frac{\ln u}{\cancel{x}} \frac{du}{\frac{1}{\cancel{x}}} = \int \ln u \, du = \int 1 \cdot \ln u = u \cdot \ln u - \int u \cdot \frac{1}{u} = u \cdot \ln u - u = u(\ln u - 1) = \ln(x) \cdot (\ln(\ln(x)) - 1) + C$

(9) $f: \mathbb{R} \to \mathbb{R}$ $\qquad x^2 + 2x + 2 = y$

$x^2 + 2x + 2 - y = 0$

$c = 2 - y$

$x = \frac{-2 \pm \sqrt{2^2 - 4 \cdot 1 \cdot (2-y)}}{2} = -1 \pm \frac{\sqrt{-8y}}{2} = -1 \pm \sqrt{-2y}$



$y - f(x_0) = f'(x_0)(x - x_0)$

$y = 0$

$-f(x_0) = f'(x_0)x - f'(x_0)x_0$

$x = x_0 - \frac{f(x_0)}{f'(x_0)}$

$$\dot{x}(t) = x(t)$$

$$\dot{x}(t) - x(t) = 0$$

$$e^{-t}(\dot{x} - x) = 0$$

$$\frac{d}{dt} e^{-t} x = 0$$

$$e^{-tc} x = 1$$

$$x = \frac{1}{e^{-tc}}$$

$$x = e^{tc} = e^{t} \cdot e^{c} = \underline{\underline{Ce^{t}}}$$