Aufgabe 1

a) $f(x) = 230x^4 + 18x^3 + 9x^2 - 221x - 9 = 0$

$230x^4 + 18x^3 + 9x^2 - 9 = 221x$

Fixpunktgleichung → $F(x) = \frac{230x^4 + 18x^3 + 9x^2 - 9}{221} = x$

$F'(x) = \frac{920x^3 + 54x^2 + 18x}{221}$ /

$x_0 = 0$	$x_0 = 0,9$
$x_1 = -0.040723982 = F(x_0)$	$x_1 = 0.734457$
$x_2 = -0.040659082 = F(x_1)$	$x_2 = 0.316343$
$x_3 = -0.040659289 = F(x_2)$	$x_3 = 0.023647$

$F'(0,9) = 2.306 > 1$

$\bar{x}$ in $[0, 1]$ ist ein abstossender Fixpunkt

b) $\bar{x} = -0.040659$ $[-0.5, 0.5]$

$F(0,5) = 0.446833 \leq 0.5$ ✓

$|F'(0,5)| = 0.622172 < 1$ ✓

$|F'(0,5)| = 0.622172 = \alpha$

c) $|x_n - \bar{x}| \leq \frac{\alpha^n}{1-\alpha} |x_1 - x_0|$

$\frac{1-\alpha}{|x_1 - x_0|} |x_n - \bar{x}| \leq \alpha^n$

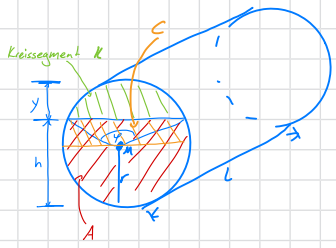
$9,278 \cdot |x_n - \bar{x}| \leq \alpha^n$

$\log_\alpha (9,278 \cdot |x_n - \bar{x}|) \leq \alpha$

$\log_\alpha (9,278) + \log_\alpha (x_n - \bar{x}) \leq \alpha$

$-4,6943004 + \log_\alpha (x_n - \bar{x}) \leq 0,622172$

Aufgabe 3



$V_2 = 2000$ Liter

3/4 gefüllt → 1'500 Liter

a) $K = \frac{1}{2} r^2 (\varphi - \sin(\varphi))$

$A = r^2 \cdot \pi - \frac{1}{2} r^2 (\varphi - \sin(\varphi))$

$C = A - \frac{1}{2} r^2 \cdot \pi = r^2 \cdot \pi - \frac{1}{2} r^2 (\varphi - \sin(\varphi)) - \frac{1}{2} r^2 \cdot \pi$

$K = \frac{1}{2} r^2 \cdot \pi - \frac{1}{2} r^2 (\varphi - \sin(\varphi))$

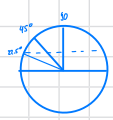
$\frac{1}{2} r^2 (\varphi - \sin(\varphi)) = \frac{1}{2} r^2 \cdot \pi - \frac{1}{2} r^2 (\varphi - \sin(\varphi))$

$r^2 (\varphi - \sin(\varphi)) = \frac{1}{2} r^2 \cdot \pi$

$\varphi - \sin(\varphi) = \frac{1}{2} \pi$

$\sin(\varphi) - \varphi = -\frac{1}{2} \pi$

b) $180 - 2 \cdot 22,5 = 135 = x_0$



$F(x) = \sin(x) + \frac{1}{2}\pi$

$x_0 = 135$	$x_9 = 2,293$	$x_{18} = 2,310$
$x_1 = 1,659$	$x_{10} = 2,321$	$x_{19} = 2,310$
$x_2 = 2,567$	$x_{11} = 2,302$	
$x_3 = 2,114$	$x_{12} = 2,315$	$\varphi = 2,310$
$x_4 = 2,426$	$x_{13} = 2,306$	
$x_5 = 2,226$	$x_{14} = 2,312$	
$x_6 = 2,363$	$x_{15} = 2,308$	
$x_7 = 2,273$	$x_{16} = 2,311$	
$x_8 = 2,334$	$x_{17} = 2,309$	