5.4.1. $x_1 = y_1 = 0$

$$x_{n+1} = 0.6x_n - 0.6y_n + 0.2$$
$$y_{n+1} = 0.6x_n + 0.6y_n + 1$$

```
function [x,y] = sequence(m,k,N)
x = zeros(1;N);
y = ——"——
x(1) = m;
y(1) = k;
for n = 1:N-1
x(n+1) = 0.6*x(n) - 0.6*y(n) +0.2
y(n+1 . . - -
end
```

$$0.6x - 0.6y + 0.2 = x$$
$$0.6x + 0.6y + 1 = y$$

$$\Updownarrow$$

$$-0.4x - 0.6y = -0.2 \quad | \cdot -5$$
$$0.6x - 0.4y = -1 \quad | \cdot 5$$

$$\Updownarrow$$

$$2x + 3y = 1 \iff x = -1$$
$$3x - 2y = -5 \qquad y = 1.$$

5.42. Tar utgangspunkt i: $x_1 = 20$, $y_1 = 2000$

$$x_{n+1} = 0.9x_n + 0.01y_n - 10$$

$$y_{n+1} = -1.01x_n + y_n + 300$$

(I) $0.9x + 0.01y - 10 = x$

(II) $-1.01x + y + 300 = y$

(II) $x = \frac{300}{1.01} \approx 297.$

(I) $y = 10x + 1000 \approx 2970 + 1000 = \underline{3970}.$

5.4.5. (oppg 4) x_n, y_n (millioner)

$$x_{n+1} = 2.2\, x_n (1 - x_n) + 0.01\, x_n y_n$$
$$y_{n+1} = 3.1\, y_n (1 - y_n) - 0.02\, x_n y_n$$

$x_1 = 0.5, y_1 = 0.5$

$x_1 = 0.1, y_1 = 0.8$

$2.2x(1-x) = x$ |

$3.1y(1-y) = y$ |

$3.1 - 3.1y = 1$

$3.1y = 2.1$

$y = \frac{21}{31} \approx 0.7$

$2.2 - 2.2x = 1$

$2.2x = 1.2$

$x = \frac{12}{22} = \frac{6}{11} \approx 0.54$

5.4.6. Firma 1 pris p : $E_1(p,q) = 1000\, e^{-p/q - \alpha(p+q)}$

Firma 2 pris q : $E_2(p,q) = 1000\, e^{-q/p - \beta(p+q)}$

a) q fast.

Inntekt firma 1 : $I_1(p,q) = 1000\, p\, e^{-p/q - \alpha(p+q)}$

Maks inntekt når

$$0 = \frac{\partial I_1}{\partial p} = 1000\left(e^{-p/q-\alpha(p+q)} + p \cdot e^{-p/q-\alpha(p+q)} \cdot \left(-\frac{1}{q} - \alpha\right)\right)$$

$$= 1000\, e^{-p/q-\alpha(p+q)} \left(1 - \frac{p}{q} - \alpha p\right) = 0$$

$$1 - p\left(\frac{1}{q} + \alpha\right) = 0$$

$$p = \frac{1}{\frac{1}{q} + \alpha} = \frac{q}{1+\alpha q}$$

("p^*")

Maks omsetning firma 2

$$q = \frac{p}{1+\beta p}$$

b) Prio finner p_1 og q_1 (5)

$$p_{n+1} = 1.1\, p_{n,\text{anb}} = \frac{1.1\, q_n}{1+\beta q_n} \quad (p_n^{\text{anb}})$$

$$q_{n+1} = 1.1\, q_{n,\text{anb}} = \frac{1.1\, p_n}{1+\alpha p_n}$$

c) $\alpha = \beta = 0.5 \quad p_1 = 3, q_1 = 4$

Fikspunkt $\quad \frac{1.1\, q}{1+0.05q} = p \quad \frac{1.1\, p}{1+0.02p} = q$

$$\frac{1.1 \frac{1.1p}{1+0.02p}}{1+0.05 \frac{1.1p}{1+0.02p}} = p$$

$$\frac{1.1 \cdot 1.1\, p}{1+0.02p+0.055p} = \frac{1.21p}{1+0.075p} = p \mid$$

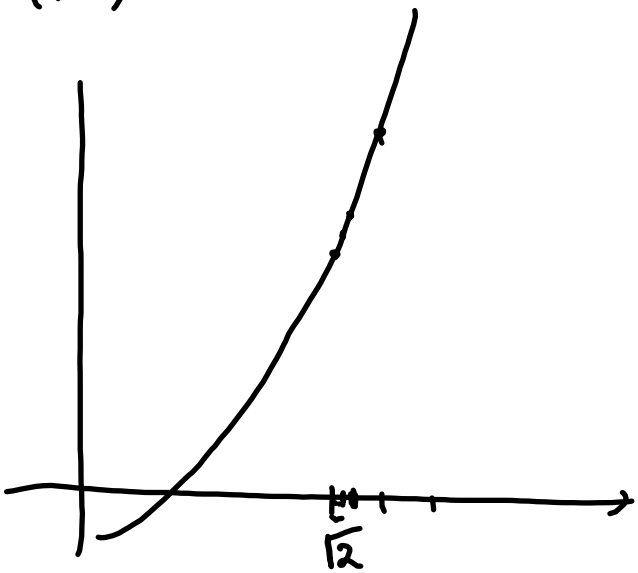
$$1+0.075p = 1.21$$

$$0.075p = 0.21 \quad p = \frac{0.21}{0.075}$$

5.4.7. $f(x) = x^2 + x - 2$

$f(\sqrt{2}) = 2 + \sqrt{2} - 2 = \sqrt{2}$ $\sqrt{2}$ fikspunkt.

Bruk $f^{(n)}(\sqrt{2})$ ved metode.



$x^2 + x - 2$

$f'(x) = 2x + 1$

$f'(\sqrt{2}) = 2\sqrt{2} + 1$

~ 3

5.5.1. a) $x_{n+1} = \frac{1}{2}\sin(x_n + y_n)$

$y_{n+1} = \frac{1}{2}\cos(x_n - y_n)$

(7)

$x \to 0.3865$.

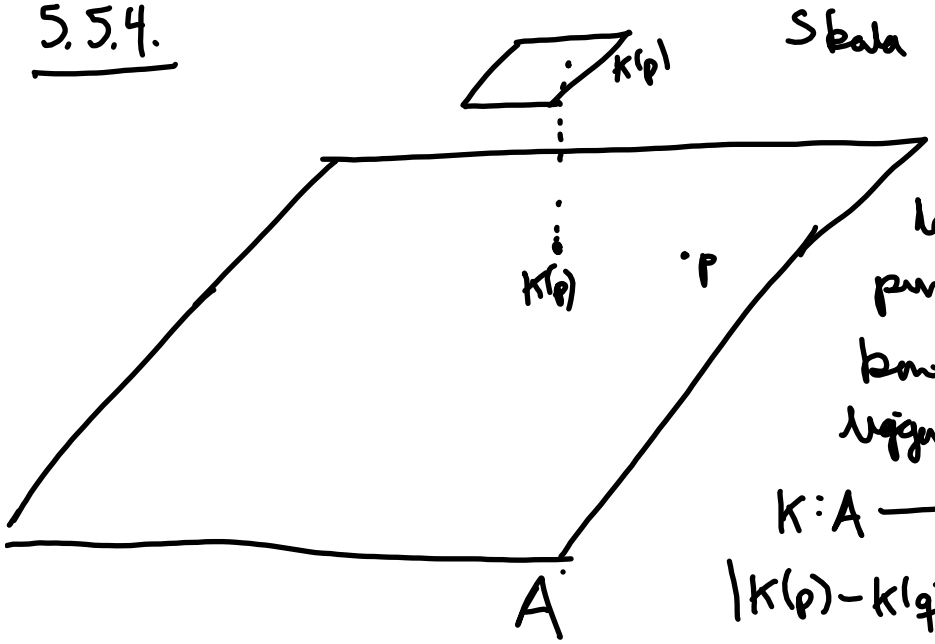
$y \to \underline{0.4970}$.

b) $x = 1, y_1 = -1$ (x+y)

$\frac{1}{2}\sin 0.8835 = 0.3865$.

$\frac{1}{2}\cos(-0.1105) = 0.4970$.

5.5.4.



Skala 1 : M M stort tall.

For alle $p \in A$

la $K(p)$ betegne punktet i A som kontrollpunktet til p ligger over.

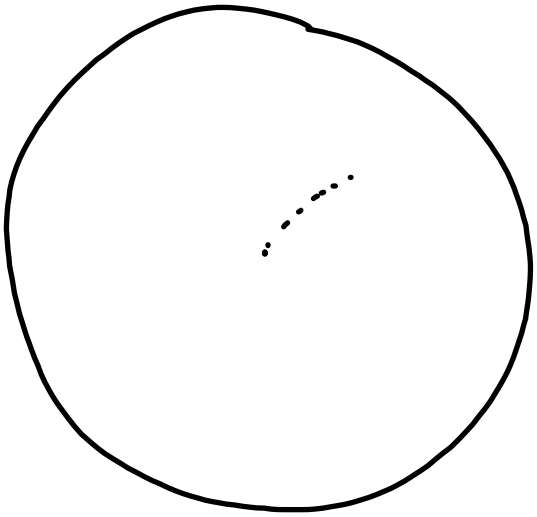
$K: A \longrightarrow A$ er kontraksjon

$|K(p) - K(q)| = \frac{1}{M} |p - q|$

K har entydig fikspunkt.

Fikspunkt: $K(p) = p$, p ligger rett under kontrollpunktet.

M =



$D \setminus \{0\}$

ikke kompakt