"Mathcad_waves_lecture_2.mcd"

$\lambda := 5cm$

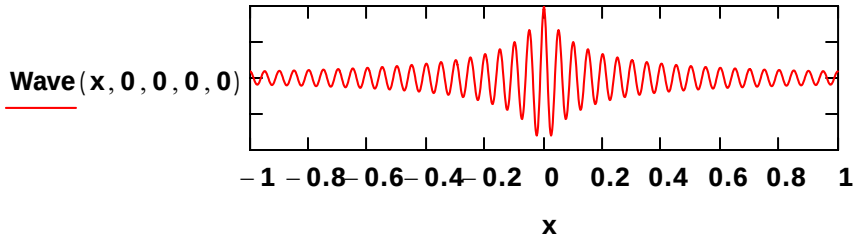
$\omega := 2\pi \cdot Hz$

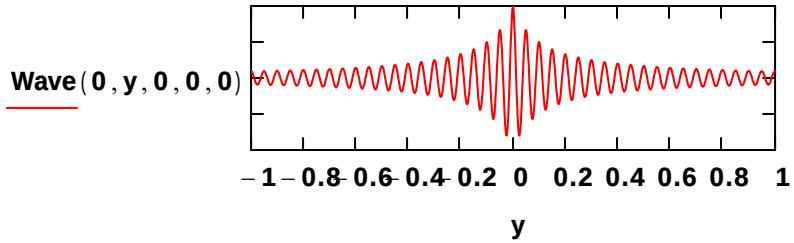
Make a circular wave:

$$R(x, y, x_o, y_o) := \sqrt{(x - x_o)^2 + (y - y_o)^2}$$

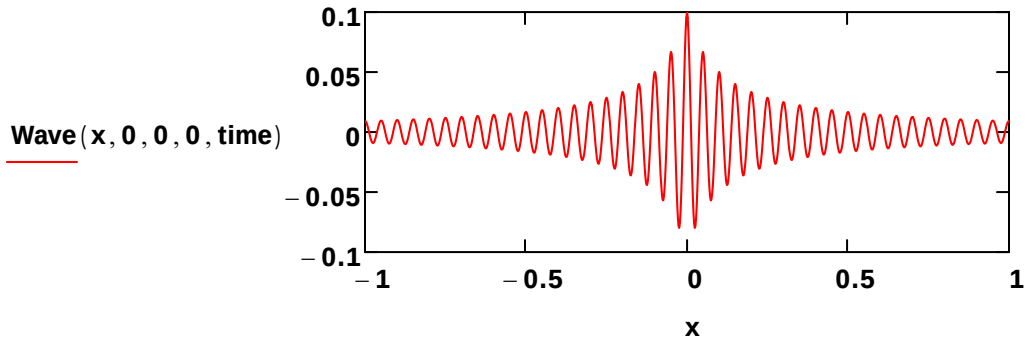
$$Wave(x, y, x_o, y_o, t) := \frac{\cos\left(\frac{2\pi}{\lambda} R(x, y, x_o, y_o) - \omega \cdot t\right)}{\frac{R(x, y, x_o, y_o)}{cm} + 10}$$

Show it behaves properly along X, Y axes:





Animating this with $time := 0.1 \cdot FRAME \cdot sec$

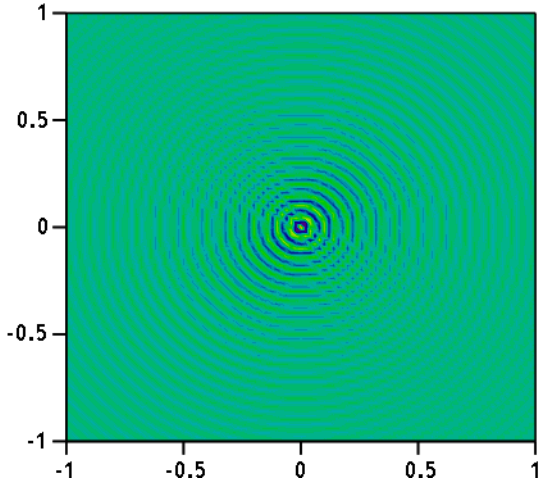


3D version of single point source::

Animating this with FRAME = 0 to 100

$$\text{time} := 0.1 \cdot \text{FRAME} \cdot \text{sec}$$

$$\text{Wave}_1(x, y) := \text{Wave}(x, y, 0, 0, \text{time})$$



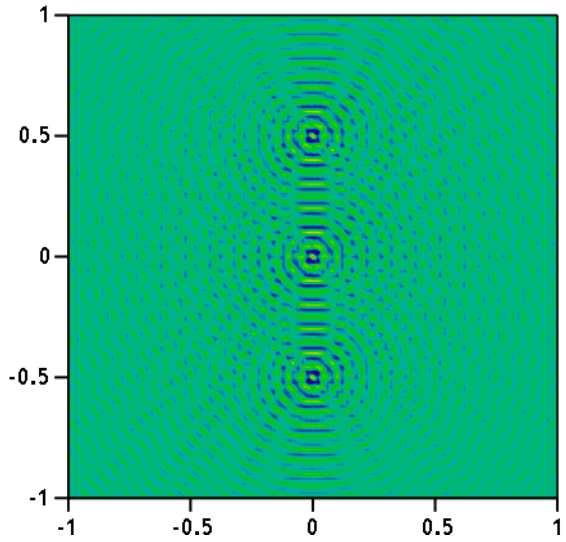
Wave_1

Three point sources in a row:

Animating this with FRAME = 0 to 100

$$\text{time} := 0.1 \cdot \text{FRAME} \cdot \text{sec}$$

$$\text{Wave}_3(x, y) := \text{Wave}(x, y, 0, -50 \cdot \text{cm}, \text{time}) + \text{Wave}(x, y, 0, 0, \text{time}) + \text{Wave}(x, y, 0, 50\text{cm}, \text{time})$$



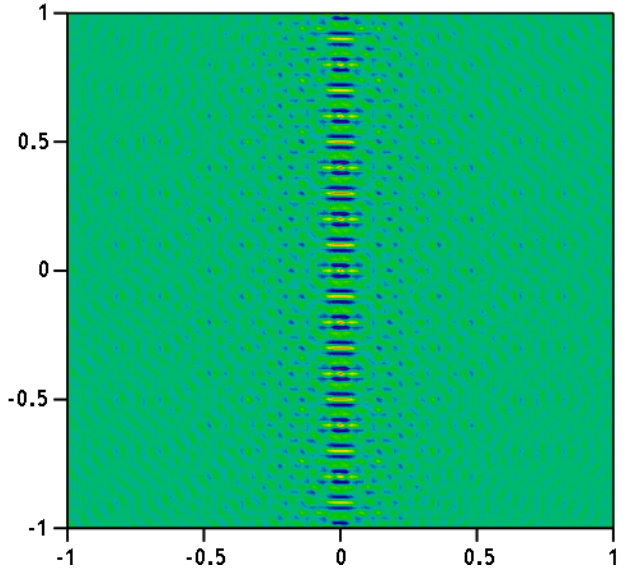
Wave_3

11 point sources in a row:

Animating this with FRAME = 0 to 100

$$time := 0.1 \cdot FRAME \cdot sec$$

$$Wave_{11}(x, y) := \sum_{y_o = -5}^{5} Wave\left(x, y, 0, y_o \cdot 20cm, time\right)$$



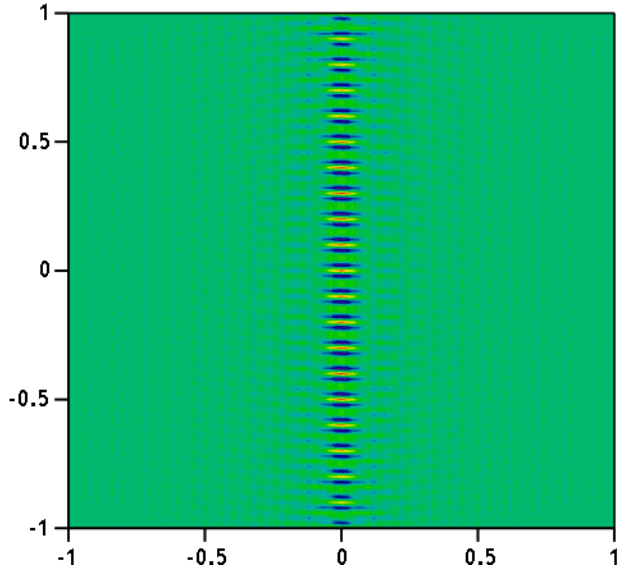
$Wave_{11}$

41 point sources in a row:

Animating this with FRAME = 0 to 100

$$time := 0.1 \cdot FRAME \cdot sec$$

$$Wave_{41}(x, y) := \sum_{y_o = -20}^{20} Wave\left(x, y, 0, y_o \cdot 5cm, time\right)$$



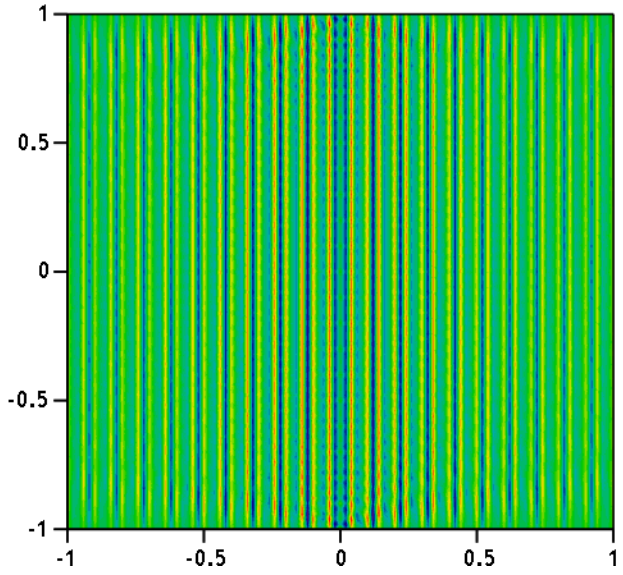
$Wave_{41}$

81 point sources in a row:

Animating this with FRAME = 0 to 100

$$\text{time} := 0.1 \cdot \text{FRAME} \cdot \text{sec}$$

$$\text{Wave}_{81}(x, y) := \sum_{y_o = -40}^{40} \text{Wave}\left(x, y, 0, y_o \cdot 2.5\text{cm}, \text{time}\right)$$



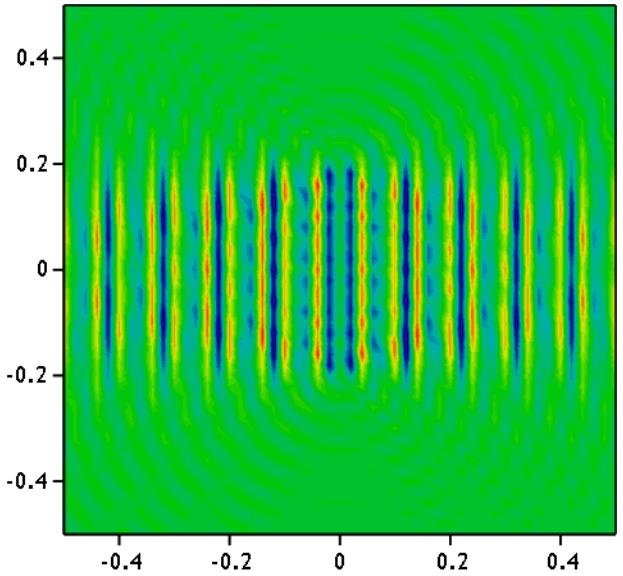
Wave_{81}

81 point sources, zoomed, with shrinking row:

Animating this with FRAME = 0 to 100

$$\text{time} := 0.1 \cdot \text{FRAME} \cdot \text{sec} \qquad d := 0.005\text{cm} \cdot (100 - \text{FRAME})$$

$$\text{Wave}_{81\_\text{shrinking}}(x, y) := \sum_{y_o = -40}^{40} \text{Wave}\left(x, y, 0, y_o \cdot d, \text{time}\right)$$



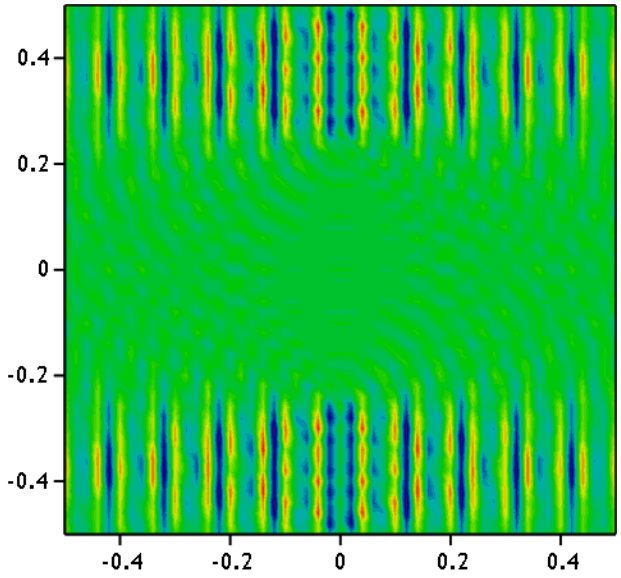
$\text{Wave}_{81\_\text{shrinking}}$

Shrinking gap, 51 sources on each side:

Animating this with FRAME = 0 to 100

$$\text{time} := 0.1 \cdot \text{FRAME} \cdot \text{sec} \qquad d := 0.005\text{cm} \cdot (100 + \text{FRAME})$$

$$\text{Wave}_{51\_gap}(x, y) := \sum_{y_o = -50}^{0} \text{Wave}\left(x, y, 0, 50\text{cm} + y_o \cdot d, \text{time}\right) + \sum_{y_o = 0}^{50} \text{Wave}\left(x, y, 0, -50\text{cm} + y_o \cdot d, \text{time}\right)$$



Wave_{51_gap}