circle through (0,0),(t,t^ 2),(–t,t^ 2)

Input interpretation:

circle	through $(0, 0)$
	through (t, t^2)
	through $(-t, t^2)$

Equation:

$$\frac{1}{4}(t^2 - 2y + 1)^2 + x^2 = \frac{1}{4}(t^2 + 1)^2$$

Properties:

center	$\left(0, \frac{1}{2}(t^2 + 1)\right)$
radius	$\dfrac{t(t^4 + t^2)}{2\sqrt{t^6}}$
diameter	$\dfrac{t(t^4 + t^2)}{\sqrt{t^6}}$
area	$\dfrac{1}{4}\pi(t^2 + 1)^2 \approx 0.785398(t^2 + 1)^2$
perimeter	$\dfrac{\pi t(t^4 + t^2)}{\sqrt{t^6}}$

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WolframAlpha computational™ knowledge engine

1/4 (t^2−2 y+1)^2+x^2 = 1/4 (t^2+1)^2 where t=0

Input interpretation:

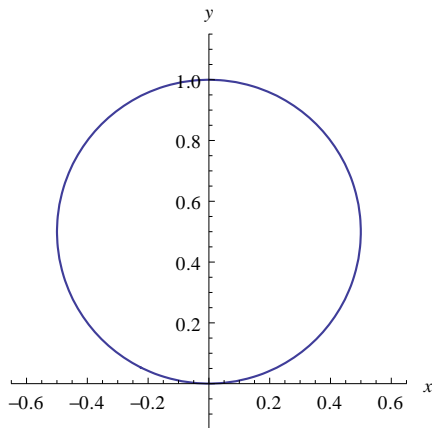$$\frac{1}{4}(t^2 - 2y + 1)^2 + x^2 = \frac{1}{4}(t^2 + 1)^2 \text{ where } t = 0$$

Result:

$$x^2 + y^2 = y$$

Geometric figure:

circle

Implicit plot:

Alternate forms:

$$y^2 = y - x^2$$

Solutions:

$$x = -\frac{1}{2}, \quad y = \frac{1}{2}$$

Integer solutions:

$$x = 0, \quad y = 0$$

Solutions for the variable : y:

$$y = \frac{1}{2}\left(1 - \sqrt{1 - 4x^2}\right)$$

Implicit derivatives:

$$\frac{\partial x(y)}{\partial y} = \frac{1 - 2y}{2x}$$

Global minimum :

$$\min\left\{\frac{1}{4}(t^2 - 2y + 1)^2 + x^2 = \frac{1}{4}(t^2 + 1)^2 \text{ where } t = 0\right\} = 0 \text{ at } (x, y) = (0, 0)$$

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X

1/4 (t^2-2 y+1)^2+x^2 = 1/4 (t^2+1)^2 where t=0

Examples   Random

Input interpretation:

$$\frac{1}{4}\left(t^2 - 2y + 1\right)^2 + x^2 = \frac{1}{4}\left(t^2 + 1\right)^2 \text{ where } t = 0$$
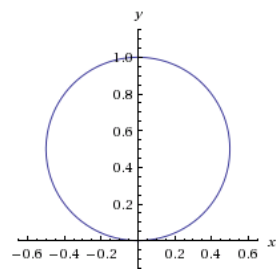
Result:

$$x^2 + y^2 = y$$

Geometric figure:

circle

Properties

Implicit plot:

Alternate forms:

$$y^2 = y - x^2$$

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

Solutions:

$$x = -\frac{1}{2}, \quad y = \frac{1}{2}$$

$$x = \frac{1}{2}, \quad y = \frac{1}{2}$$

Integer solutions:

$$x = 0, \quad y = 0$$

$$x = 0, \quad y = 1$$

Solutions for the variable y:

$$y = \frac{1}{2}\left(1 - \sqrt{1 - 4x^2}\right)$$

$$y = \frac{1}{2}\left(\sqrt{1 - 4x^2} + 1\right)$$

Implicit derivatives:

More

$$\frac{\partial x(y)}{\partial y} = \frac{1 - 2y}{2x}$$

$$\frac{\partial y(x)}{\partial x} = \frac{2x}{1 - 2y}$$

Global minimum:

$$\min\left\{\frac{1}{4}\left(t^2 - 2y + 1\right)^2 + x^2 = \frac{1}{4}\left(t^2 + 1\right)^2 \text{ where } t = 0\right\} = 0 \text{ at } (x, y) = (0, 0)$$

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[Infrastructure for this computation provided by Wolfram|Alpha compute partner Dell, Inc..]
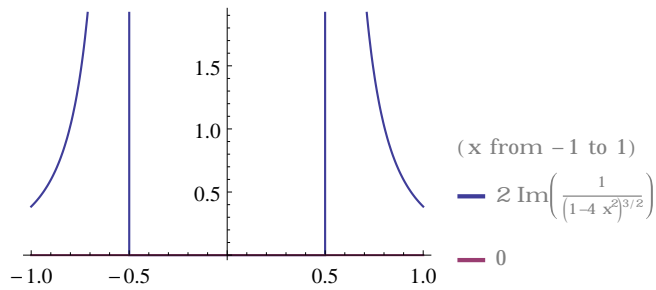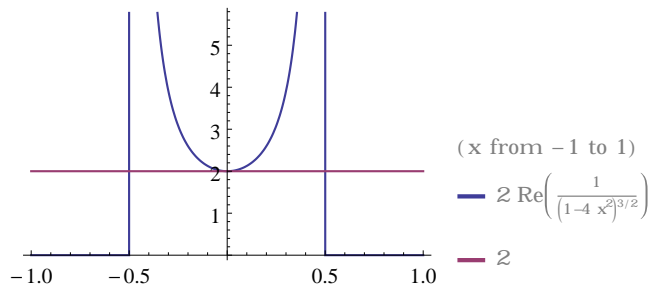
second der {1/2 (1−sqrt(1−4 x^ 2)), x^ 2}

Derivative:

$$\frac{d^2}{dx^2}\left(\left\{\frac{1}{2}\left(1-\sqrt{1-4x^2}\right), x^2\right\}\right) = \left\{\frac{2}{(1-4x^2)^{3/2}}, 2\right\}$$

Plot:

(x from −1 to 1)

— $2\,\mathrm{Re}\left(\frac{1}{\left(1-4\,x^2\right)^{3/2}}\right)$

— 2

(x from −1 to 1)

— $2\,\mathrm{Im}\left(\frac{1}{\left(1-4\,x^2\right)^{3/2}}\right)$

— 0

Parametric plot:

(x from −0.89 to 0.89)

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