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## 1. A curve in the plane and a function

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Recitation due Sep 13, 2021 20:30 IST Completed

**Review**

## A normal vector to the circle at an arbitrary point

1.0/1 point (graded)

Let $c$ be the circle of radius 2 around the origin. The curve $c$ is defined by the equation $x^2 + y^2 = 4$. For a given point $(x, y)$ in $c$, find a vector $\vec{n}$ which is normal to $c$ at $(x, y)$.

(Enter a vector components separated by commas, and surrounded by square brackets: `[a,b]`.)

[2*x,2*y] ✔ **Answer:** [2*x,2*y]

**Solution:**

The curve $c$ is the level curve of the function $g(x, y) = x^2 + y^2$. And the gradient is normal to the level curves of a function. Thus for any point on the circle, the gradient vector of $\nabla g(x, y) = \langle 2x, 2y \rangle$ is normal to the level curve, the circle of radius 2.

Submit You have used 1 of 20 attempts

Answers are displayed within the problem

## Sanity check

1.0/1 point (graded)

As in the last problem, let $c$ be the circle of radius 2 around the origin. Let $f(x, y) = y$. Just using your geometric understanding, find the point of the curve $c$ where $f$ is maximal.

(Enter the point as an ordered pair surrounded by round parentheses: `(a,b)`.)

(0,2) ✔ **Answer:** (0,2)

Confirm that $\nabla f$ is perpendicular to $c$ at this point.

Submit You have used 2 of 10 attempts

Answers are displayed within the problem

## Find all points where the gradient is normal to the circle

3.0/3 points (graded)

As in the last problem, let $c$ be the circle of radius 2 around the origin. Let $f(x, y) = xy$. Find all the points on the curve $c$ where $\nabla f$ is normal to $c$. Find the maximum of $f$ on the curve $c$ and the minimum of $f$ on the curve $c$.

(Enter the point as an ordered pair surrounded by round parentheses. Separate multiple points by semicolons. E.g. `(a,b); (c,d) ; (e,f)`.)

Points where $\nabla f$ is normal to $c$.

(sqrt(2),sqrt(2));(-sqrt(2),sqrt ✔

**Answer:** (sqrt(2),sqrt(2));(-sqrt(2),-sqrt(2));(-sqrt(2),sqrt(2));(sqrt(2),-sqrt(2))

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Maximum of $f$ on $c$:

2 ✔ **Answer:** 2

Minimum of $f$ on $c$:

-2 ✔ **Answer:** -2

Submit You have used 3 of 25 attempts

Answers are displayed within the problem

## 1. A curve in the plane and a function

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