

Quiz 06.md

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Attempts	Score
1/1000	7/7

Question 01

What shapes have constant Euclidean curvature?

Answer

Straight lines and Circles.

Explanation

The Euclidean curvature is zero for straight lines, and $1/\text{radius}$ for circles.

Question 02

The gradient of a function $f(x,y)$ is

Answer

Perpendicular to the level lines of $f(x,y)$.

Explanation

This is shown in the video when we discussed level sets and implicit representations, and we proved such result.

Question 03

Consider the functional $(\text{Integral}|\text{Del } I|^p)$ for an image $I(x,y)$ and $p > 0$. For which p the Euler-Lagrange of the functional will lead to anisotropic diffusion?

Answer

$p = 1$.

Explanation

We have seen that for $p = 1$ this gives "curvature motion", a type of anisotropic diffusion. For $p = 2$ this gives the isotropic diffusion or heat flow. For $p > 2$ we also get additional diffusion across edges instead of reduced diffusion.

Question 04

Considering a planar curve C embedded as the zero level set of a function $f(x,y)$. The curve moves with constant velocity. Then $f(x,y)$ is deforming according to

Answer

$f_t = -|\text{Del } f|$.

Explanation

We have demonstrated that the general motion is $\dot{\mathbf{r}} = V \cdot \mathbf{e}_\perp$ when the curve is moving with speed V in the normal direction. In this case (constant motion) $V = 1$.

Question 05

Consider a circle of radius $1/8$. What is the relationship between the affine arc-length dv and the Euclidean arc-length ds for this circle?

Answer

$dv = 2 \cdot ds$.

Explanation

We have that $dv = \kappa^{1/3} ds$, and since the radius is $1/8$, the curvature κ is 8 .

Question 06

Consider a planar shape in an image, with its boundary deforming with only tangential velocity. What will happen to the object inside such boundary?

Answer

It will not change.

Explanation

Tangential motion does not change the shape of a curve and its surrounding shape.

Question 07

Considering an image with only circular objects of known radius. Which of the following techniques would you use to detect their centers:

Answer

Hough transform.

Explanation

While we could use active contours, since the shape of the objects is known, it is more appropriate to use the Hough transform.