Midterm review: Cameras

• Pinhole cameras
• Vanishing points, horizon line
• Perspective projection equation, weak perspective
• Lenses
• Human eye

• Sample question: “What property must 3D lines have so that they converge to the same vanishing point in an image? Assume standard perspective projection.”
Midterm review: Filters

• Convolution
• Box filters, Gaussian filters, derivatives
• Separable filters
• Aliasing, Gaussian pyramids, template matching

• Sample question: “What does the following 3x3 linear filter compute when applied to an image?”

\[
\begin{array}{ccc}
0 & 0 & 0 \\
-2 & 0 & 2 \\
0 & 0 & 0 \\
\end{array}
\]
Midterm review: Edges and Corners

• Derivative of Gaussian, image gradients
• Edges at different scales
• Canny edge detector
• Harris corner detector

• Sample question: “Why is non-maximum suppression applied in the Canny edge detector?”
Midterm review: Texture

- Texture representation
- Laplacian pyramid, oriented pyramid
- Texture matching
- Texture synthesis (details of homework)

Sample question: “Why does the top-most image in a Laplacian pyramid differ from the others?”
Midterm review: Stereo Vision

- Epipolar constraint, image rectification
- Ordering and brightness constancy constraints
- Normalization of image patches
- Window size
- Dynamic programming approach

Sample question: “Under what conditions is the ordering constraint violated in stereo matching?”
Midterm review: Segmentation

- Gestalt properties
- Agglomerative clustering, dendrogram
- K-Means clustering (EM details not required)
- Background subtraction

Sample question: “The simplest method for background subtraction is to just subtract the pixels in one frame from the previous one. Why do many systems instead try to build a model of the background from extended image sequences?”
Midterm review: Fitting a Model

• Hough transform
• RANSAC
• Inliers vs. outliers, iterative fitting

• Sample question: “Explain the factors that determine what size of bin to use in the Hough transform?”