Creating graphics for use in AMS books and journals

AMS
AMERICAN MATHEMATICAL SOCIETY

GENERAL GUIDELINES

- **Create graphics at 100%**

Lines and rules

- **Do not use a line/rule weight less than .5 point at 100%**

  If you must scale your figure, be sure that you compensate by making line weights thicker. A .5 point line scaled at 50% becomes a .25 point line. Line weights below .5 point disappear during the printing process.

- **Graded lines should increase in increments of .5 point (i.e.: .5 point, 1 point, 1.5 point)**

  Increments less than .5 point do not read as distinctly different lines.

- **Lines that are a shade of gray (screened) need a line weight of at least 1 point at 100%.**

  Gray lines smaller than 1 point look broken and jagged because of the small dot pattern used to simulate shades of gray.
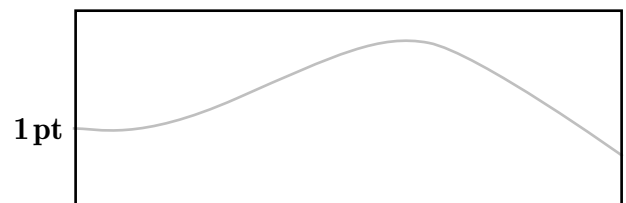
Shades of gray (screens)

- **Screens defined**

  A screen is a pattern of small black or white dots used to simulate shades of gray.

- **Shades of gray (screens) should not be lower than 15% or higher than 85%**

  Screens outside of this range are either too light or too dark to print correctly.

- **Screens should increase in increments of no less than 10%**

  Screen variations of less than 10% are not distinguishable.

- **Do not put type on top of a screen darker than 35%**

  Type on a screen that is above 35% is not legible.

- **White type can be used only on 100% black**

  White type on a gray background looks broken and jagged because a small dot pattern is used to simulate shades of gray.
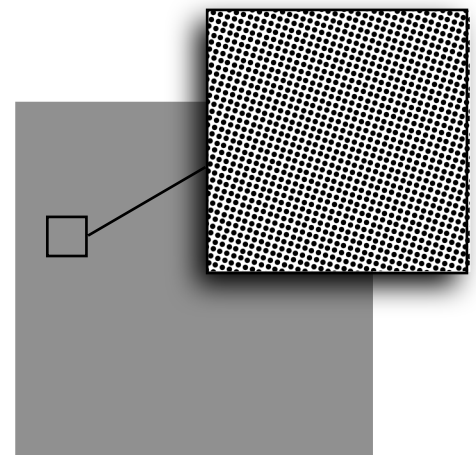
Graded lines
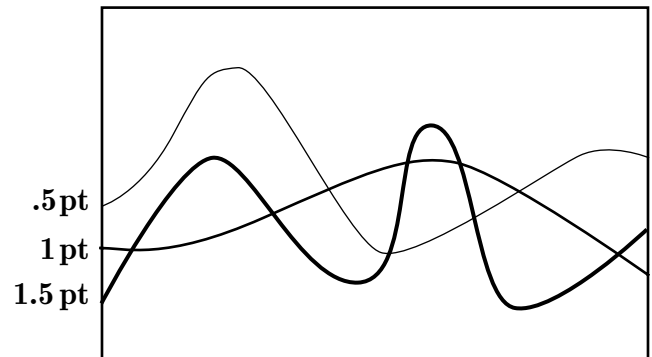
.5 pt
1 pt
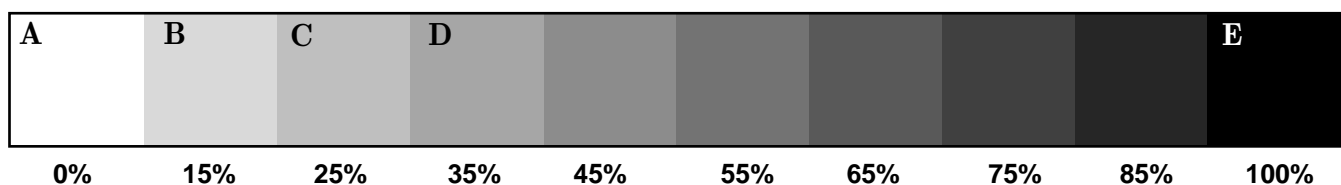1.5 pt

Screened line

1 pt

Dot pattern used to simulate shades of gray

Shades of gray (screens)

A	B	C	D						E
0%	15%	25%	35%	45%	55%	65%	75%	85%	100%

Multiple-part figures

• **Multiple-part figures should be configured to one figure in a graphics program, not in TeX**

  Aligning multiple-part figures is very difficult in TeX. It is easier and more cost-effective to do so in the graphics program.

Clipping and bounding boxes

• **When using a smaller area of a larger graphic, clip or crop within the graphics application to delete all but the desired portion**

  Do not clip or crop by pasting areas of white over portions of the graphic. Doing this will make the bounding box larger than it should be, resulting in problems when including the graphic in TeX.

• **If possible, verify that bounding box information is correct**

  Problems arise when the bounding box is not correct. Graphics might be clipped off in unexpected ways.

Type Size

• **Type point size should be no less than 10 point at 100%**

  If you must scale your figure, be sure that you compensate by making the type point size larger. 10 point type scaled at 50% becomes 5 point type, which would not be readable.

Font usage

• **Whenever possible, fonts used in graphics should match those used in text**

• **Use Type 1 outline fonts instead of bitmap fonts**

  Type 1 outline fonts are vector based. These fonts do not lose quality when output to high resolution printers.

• **Fully embed fonts into your graphic when saving the file**

  If the fonts are not embedded in your graphic, it is possible that the font will be replaced with a default font such as Courier, and the characters will not print properly. If you are unable to embed the fonts in your graphic, convert the fonts to paths (or outlines) prior to exporting the file to EPS. This can be done in the application in which they were created (consult the documentation for your graphics program for assistance).

• **Do not subset fonts included in your graphic**

  It is imperative that the full font set be included in your graphic. If only a subset of a font is included, a font error can occur, causing characters to possibly disappear in both the graphic and the DVI file.

• **Avoid fonts with city names such as Chicago, Monaco, Geneva, etc.**

## SAVING GRAPHICS — NEED-TO-KNOW FACTS

Vector vs. Raster

• **Vector art**

  Vector images are created in "Drawing" programs. A vector-based graphics program uses points connected with curved or straight lines, like connect-the-dots. The spaces defined by the lines can be empty or filled with color. These points, curves, and lines are defined with code. The code is basically a set of x, y coordinates and draw commands. The advantage to using vector art is that it is resolution independent (it can be enlarged and will never lose quality).

• **Raster art**

  Raster or bitmapped images are created in "Paint" programs which use pixels to define images. A pixel (short for picture element), is a square of color arranged on a grid. Resolution refers to the amount of pixel information per inch. If the resolution or pixels per inch (PPI) is too low, the image will appear "jagged". For this reason it is extremely important that resolution be set according to the following guidelines.
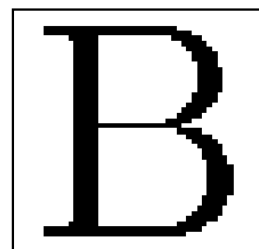
- Resolution defined

  In digital images, resolution refers to the amount of pixel information per inch. If the resolution or pixels per inch (PPI) is too low, the image will appear "jagged".

- Resolution requirements for bitmap graphics

  Line Art—1200 PPI @ 100%

  Halftone—600 PPI @ 100%

  Combination halftone—600 PPI @ 100%

- If you must scale your graphic, be sure to compensate by making the resolution higher. A 300 PPI graphic scaled at 50% becomes a 150 PPI graphic. Resolutions below 300 PPI will look jagged.

Figure types

- **Line Art —1200 PPI @ 100%**

  Purely black and white figures with no shades of gray. Best if created and saved as a vector graphic. If not, the resolution must be 1200 PPI.

- **Halftone — 600 PPI @ 100%**

  Figures or photographs with shades of gray. Also referred to as grayscale.

- **Combination Halftone — 600 PPI @ 100%**

  Halftones that contain line art, such as labeling or outlines. Can be photographic or lines filled with shades of gray.
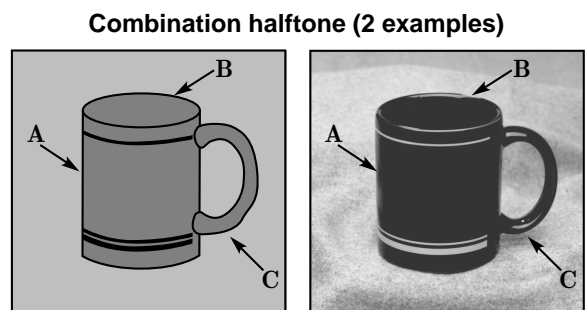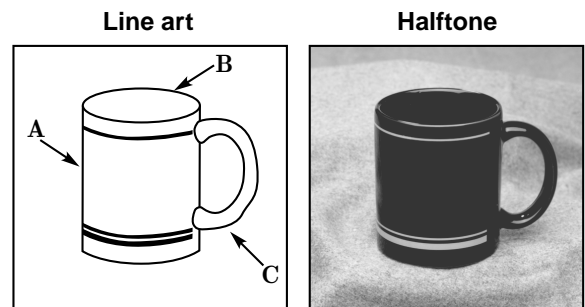
COLOR GRAPHICS

- **Requirements for graphics to be published in color**

  Color graphics should be saved in the following format:

  Electronic only journals: RGB format

  Electronic and/or print journals: CMYK format

  Note that color graphics should be used in the print product only if it is mathematically essential to the paper. Authors will be requested to pay for the cost of color in the print product.

- **Color graphics to be printed in black and white or grayscale should be converted to black and white or grayscale before submitting to the AMS**

  Do not create a graphic in color if it is not to appear in color in the published product. These graphics should be saved as grayscale. Also, files prepared for black and white require much less computer space than files prepared for color.

- **CMYK and RGB defined**

  CMYK is an acronym for cyan, magenta, yellow, and black; the standard ink colors used in four-color process (full-color) printing.

  RGB is an acronym for red, green, and blue; the color model used for computer monitors and video output systems.

Line art   **Halftone**

Combination halftone (2 examples)

DUAL PRODUCT GRAPHICS (PRINT AND ONLINE GRAPHICS)

- **For dual product (print and online) books and journals, color graphics should be saved in CMYK format**

- **Do not use a line/rule weight less the 1 point (1 pixel @ 72 PPI) at 100%**

  Although a .5 point line is acceptable for print, screen resolution is 72 PPI and .5 point line will disappear online.

- **Type point size should be no less than 12 point at 100%**

  Although a 10 point type is acceptable for print, screen resolution is 72 PPI and 10 point type will be difficult to read online.

- **Do not put type on top of a dark color**
  Type on dark colors is not legible.

- **Check your figure to a black and white printer**
  Many people do not have color printers. Be sure that a black and white printout of your figure is legible.

ELECTRONIC ONLY GRAPHICS

- **Use the same consideration as for dual product graphics except that the figure should be saved in RGB format**

NONELECTRONIC GRAPHICS

Hand-drawn graphics

Hand-drawn graphics should be drawn in black ink with clean, unbroken lines on nonabsorbent paper and at the size they will appear in the published product. The appropriate amount of white space should be left in the TeX file for the graphics to be pasted into the paper.

Photographs and computer-generated images supplied only on paper

These are also considered nonelectronic graphics.

- When possible, please submit originals rather than scanning them on your own. The tonal values are adjusted by the publisher to comply with the specific stock and press that the photograph or computer generated image is being printed on.

General guidelines for all nonelectronic graphics

- Follow the applicable "general guidelines" at the beginning of this guide

- Whenever possible, fonts used in these graphics should match those used in text.

- The original and a labeled photocopy should be supplied with the final manuscript of accepted papers.

- Do not fold nonelectronic graphics.

- Package nonelectronic graphics in cardboard so that they are not bent or damaged in the mail.

PLACING FIGURES IN YOUR PAPER

- **Use a standard TeX graphics inclusion macro package**
  The recommended graphics inclusion package for LaTeX2e is graphicx. Be sure that commands used to include graphics in TeX are compatible with Radical Eye Software's dvips.

- **Number figures consistently throughout the paper**

- **Place the figure at the top or the bottom of the page**

- **Use an in-text reference**

- **Set figure captions in TeX**

- **Set figure captions below the figure**

- **Make sure figures are sized correctly and do not extend into the margins of the paper**
  If the figure is too large, resize the figure in a graphics program, not in TeX.

- **Leave 1.5 picas (1/4") from figure caption to text below**
  This is an automatic feature in the AMS author packages.

- **Leave 1.5 picas (1/4") from text above to graphic below**
  This is an automatic feature in the AMS author packages.