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## 4321

1. Consider the function  $f(x) = \frac{x}{\pi}$  on the interval  $0 \leq x \leq 2\pi$ 
  - (a) Sketch a graph of the function  $f(x)$  versus  $x$ , labeling interesting points.
  - (b) Sketch an EVEN periodic function that is identical to the given function  $f(x)$  where  $f(x)$  has support (where it is nonzero).
  - (c) What is the period of this even function?
  - (d) Sketch an ODD periodic function that is identical to the given function  $f(x)$  where  $f(x)$  has support.
  - (e) What is the period of this odd function?
  - (f) Which periodic function (even or odd) has a Fourier series approximation which will converge faster to  $f(x)$ ? Why?
  - (g) Find the first five nonzero terms in any Fourier expansion of the function where it has support, not just the coefficients  $a_n$  and/or  $b_n$  but also the terms with  $x$  dependence.
  - (h) Plot using software (not by hand) the original function  $f(x)$  and your Fourier approximation to the function. You may use more than five terms if you wish.

## 7305

1. Consider the first full period of the sine function:  $\sin(x)$ ,  $0 < x < 2\pi$ .
  - (a) Expand this in a Fourier **cosine** series and list the first four non-zero Fourier coefficients. (This is not a trick question. You can expand any function outside its given range as either an even or an odd function.)
  - (b) Plot using software (not by hand) the original function and your four-term approximation using a computer for the range  $0 < x < 2\pi$ .
  - (c) Plot using software (not by hand) the original function and your four-term approximation using a computer for the range  $-2\pi < x < 0$ . Comment.
  - (d) Expand  $\sin(x)$ ,  $0 < x < 2\pi$ , in a Fourier sine series. Find all the coefficients.

**Bonus:** Solve as much of the other class' assignment as you can.