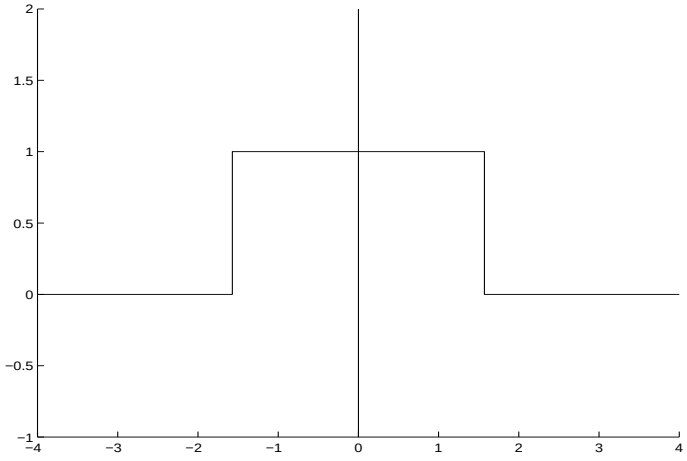
ENEE241/MATH242 Dr. Wolfe SAMPLE THIRD HOUR EXAM

1, Let

$$f(x) = \begin{cases} 0 & \text{for} -\pi \le x \le \frac{-\pi}{2} \\ 1 & \text{for } \frac{-\pi}{2} < x < \frac{\pi}{2} \\ 0 & \text{for } \frac{\pi}{2} \le x \le \pi \end{cases}$$

The graph of f is shown below. Find the Fourier series representation of f.



2. Suppose that $f(x)$ is a smooth function such that

$$\int_2^5 f(x)\,dx = 6$$

Suppose the result of applying the trapezoid rule with 20 panels to approximate this integral is $T_{20} = 5.84$. Give an estimate of T_{40}, the result of applying the trapezoid rule with 40 panels. Explain.

3. (10 points)Suppose we use Simpson's rule with 400 panels to approximate

$$I = \int_0^1 (x^3 + 3x^2 - x)dx.$$

Assuming no roundoff error, what will the result be ? Explain.

4. Let

$$I = \int_0^1 \frac{1}{1+x}\,dx = \ln 2 = .69314718$$

Compute approximations to I using
(a) The 4 panel trapezoid rule.
(b) The 4 panel Simpson's rule.
(c) The 4 panel corrected trapezoid rule.
Which method gives the best result ?