

PROBLEM ONE [5 PTS.]

Sketch the graph to which the *sine series* of period 2 for $f(x)$ converges, if $f(x) = 2 - x$, $0 < x < 1$.

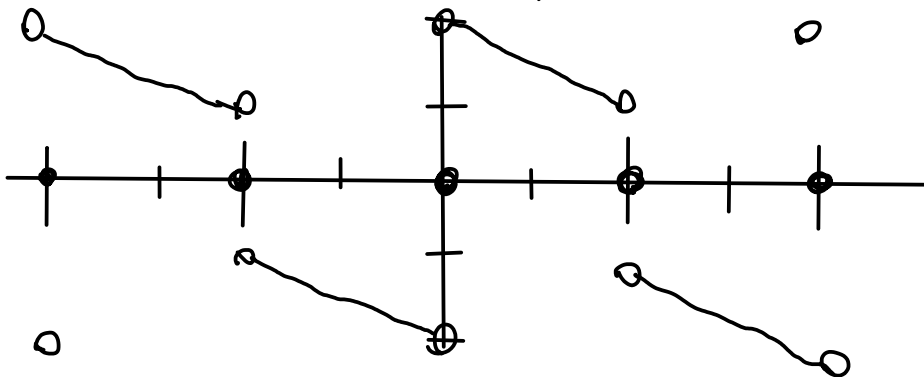
1 Pt: Equal to $f(x)$ [where continuous] on $(0,1)$

1 Pt: Odd

1 Pt: Periodic (period 2)

1 Pt: Jump discontinuities look like this: \circ
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(Last Pt was discretionary)



PROBLEM TWO [5 PTS.]

Determine whether the method of separation of variables can be used to replace the PDE $u_{xx} + u_{yy} - yu = 0$ by a pair of ODEs. If so, find the equations.

Assume $v(x,y) = X(x)Y(y)$. Don't confuse capital + small letters — use $F(x)G(y)$ if necessary.

Plug in: $X''Y + XY'' - XYy = 0$

Divide by XY
+ separate: $\frac{X''}{X} = y - \frac{Y''}{Y}$

Set both equal to a constant (as LHS is a function of x , RHS is a function of y , and the two are equal)

$$\boxed{\frac{X''}{X} = \lambda = y - \frac{Y''}{Y}}$$

(Simplify as desired; name of the constant is unimportant)