So, what about the hint? Another way to solve this problem is to apply a differential excitation (say, I/2 into X, and I/2 out of its counterpart on the left-hand side), and then a common-mode excitation (I/2 into both nodes). The perfect symmetry of excitation and circuit in each case facilitates analysis. One need only sum the individual voltages induced at X. This method requires more steps, but depends much less on intuition, because the symmetry of the circuit AND excitations allows you to use the time-honored tricks of folding or bisecting, etc. to compute the induced voltages with a simplified circuit.

Common mistakes: The following is a partial list of widespread errors:

Almost everyone chose to retain the static DC current sources when computing small-signal resistance. Failure to remove these sources unnecessarily clutters derivations, and inhibits getting to the answer. When doing small-signal analysis, do yourself a favor and begin by setting all independent sources to their zero value.

Many students also didn't understand how to identify when something has symmetry. Yes, this *circuit by itself* is symmetrical, but adding the *excitation* required to investigate resistance introduces an asymmetry (the question asks for the single-ended resistance). So, you can't fold or bisect *first*, and *then* compute resistances. This error was disappointingly common. Study the alternate solution method above for an example of how to exploit symmetry.

Another common error was to hand-wave the OTA into irrelevance by saying "it's ideal, with infinite output impedance, so no current flows out of it." The OTA is a *dependent current source*, and is connected here in a feedback loop. Impedances can be modified in non-obvious ways. To avoid tripping up, just *measure* the impedance, as asked. There's no need to guess (and you shouldn't, if your circuit intuition is weak).

Another surprising error was the random grounding of the inverting inputs. Yes, it's a virtual ground, but the key word is *virtual*. It's not a real ground. The virtual ground's potential is indeed zero volts. However, arbitrarily adding a wire from this node to real ground then introduces a spurious branch through which currents can flow. It also deactivates the OTA (you've turned off the control voltage). Make sure you understand when and when not adding a wire to ground is correct.