

Part 3 — A catalog of fixed points

Each function below has exactly one fixed point in the interval given. For each one: change `f`, run your program with that interval, and record the fixed point and its classification.

#	$f(x)$	Java	Interval $[lo, hi]$	Fix pt	Type
1	$\cos x$	<code>Math.cos(x)</code>	$[0, 1]$		
2	e^{-x}	<code>Math.exp(-x)</code>	$[0, 1]$		
3	$1 + 1/x$	<code>1 + 1/x</code>	$[1, 2]$		
4	$(x + 2/x) / 2$	<code>(x + 2/x) / 2</code>	$[1, 2]$		
5	$2 \sin x$	<code>2 * Math.sin(x)</code>	$[1, 3]$		
6	$3.2x(1 - x)$	<code>3.2 * x * (1 - x)</code>	$[0.4, 1]$		
7	$4 - x^2$	<code>4 - x * x</code>	$[1, 2.5]$		
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Fill in the table above, adding the fixed point to six decimal places, and attracting or repelling. Then add your own function with a fixed point.

Then:

- Two of these fixed points are numbers you already know by another name. Which two, and what are they? (Compare your decimals against something familiar.)
- Function 4 converges under iteration *much* faster than the others. Iterate it by hand from $x = 1$ a few times and see. What's special about it?
- Sort your seven functions into the attracting group and the repelling group. Sketch each function near its fixed point, together with the line $y = x$. What do the attracting cases have in common that the repelling cases don't? State your conjecture as precisely as you can — this is the interesting part of the assignment.