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example of divided difference interpolaton

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To illustrate how one interpolates a function using divided differences, we will interpolate $\sin 40^\circ$ from the sines of 0° , 30° , 45° , 60° , and 90° . To keep from having too many zeros in our numbers, we will actually interpolate $\sin(10x)$ instead.

We begin by making a divided difference table:

0.0	0.0000			
		0.1667		
3.0	0.500		-0.00636	
		0.1381		-0.001786
4.5	0.7071		-0.01071	-0.0001445
		0.1060		-0.000486
6.0	0.8660		-0.01362	
		0.0447		
9.0	1.0000			

Reading off the top numbers from each column, we may form the following divided difference series:

$$\sin(10x) = 0.1667x - 0.00636x(x - 3) - 0.001786x(x - 3)(x - 4.5) \\ - 0.0001445x(x - 3)(x - 4.5)(x - 6) + R$$

Substituting 0.4 for x , we obtain 0.6502 as an approximate value for $\sin 40^\circ$. When compared with the actual value of 0.6428, this is a reasonable approximation —it is correct to 1%.