The wave equation

1. Suppose the wave speed is c = 2.0 m/s and a string is initially at rest. Suppose the string is 5 m long.

a. What is an appropriate value of Δt?

Answer: $\Delta t = 0.25$

b. Suppose both boundaries are initially at rest, but then at t = 0.25s, the one boundary is brought up to one, and immediately brought back to 0 before t = 0.5. Fill in the initial and boundary conditions for up to 2 seconds.

Answer:

0	1	0	0	0	0	0	0	0
0								
0								
0								
0								
0	0	0	0	0	0	0	0	0

c. Find the propagation for up to one second.

Answer:

0	1	0	0	0
0	0	0.25	0.375	0.3281
0	0	0	0.0625	0.1875
0	0	0	0	0.015625
0	0	0	0	0
0	0	0	0	0

d. The following shows the propagation for three seconds:

0	**1**	0	0	0	0	0	0	0	0	0	0	0
0	0	**0.25**	**0.375**	**0.3281**	0.1641	-0.0059	-0.0908	-0.0734	-0.0049	0.0457	0.0436	0.0047
0	0	0	0.0625	0.1875	**0.3047**	**0.3281**	0.2278	0.0579	-0.0818	-0.1192	-0.0599	0.0253
0	0	0	0	0.0156	0.0703	0.167	**0.2681**	**0.3103**	**0.2501**	0.103	-0.0603	-0.1627
0	0	0	0	0	0.0039	0.0234	0.073	0.1531	0.2342	**0.2607**	**0.1827**	-0.0018
0	0	0	0	0	0	0	0	0	0	0	0	0

Does this make sense?

Answer: While this is a course approximation, highlighted in the table above is the peak, and as you may note, the peak appears to be travelling at approximately 2 meters per second (one cell per two time steps).

2. What is c for the electromagnetic force, assuming a vacuum?

Answer: 299792458 m/s