

# Warm-Up for May 9th, 2022

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May 9, 2022

## 1 Memory Bank

1. Displacement current:  $\mathbf{J}_D = \epsilon_0 \frac{\partial \mathbf{E}}{\partial t}$
2. Ampère's Law:  $\nabla \times \mathbf{B} = \mu_0 \mathbf{J} + \mu_0 \epsilon_0 \frac{\partial \mathbf{E}}{\partial t}$

## 2 RC Circuits and RL Circuits

1. A fat wire, radius  $a$ , carries a constant current  $I$ , uniformly distributed over its cross section. A narrow gap in the wire, of width  $w \ll a$ , forms a parallel-plate capacitor, as shown in Fig. 1. Find the magnetic field in the gap, at a distance  $s < a$  from the axis.

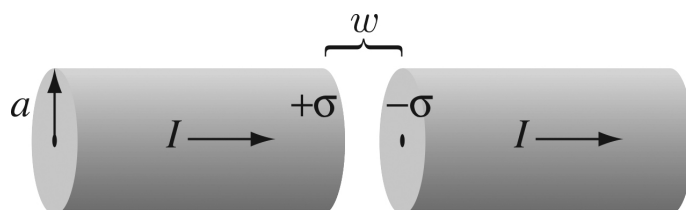


Figure 1: A small gap of width  $w$  in a wire of radius  $a$ . The wire carries a current  $I$ .