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## Problem Set 3

### 1 Readings

See syllabus for reading assignments.

### 2 Problems

All problems are from Griffiths

1. 2.32
2. 2.33
3. 2.38
4. 2.48 a-d
5. 2.49 a-c
6. 2.51
7. 3.1
8. 3.2
9. 3.9
10. The English Channel tunnel consists of a series of tunnels, each with a set of railroad tracks. As an order of magnitude estimate, calculate the capacitance of an idealized tunnel, cylindrical in shape with a monorail which is also cylindrical and is coaxial to the tunnel. Both the outer and inner cylinders are conducting. The length of tunnel is  $l$ , the diameter of monorail is  $d$ , and the diameter of tunnel is  $l = 5.0 \cdot 10^1 km$ ,  $d = 5.0 \cdot 10^1 cm$ ,  $a = 1.0 \times 10^1 m$ 
  - (a) Find the capacitance of this idealized tunnel.
  - (b) Does the capacitance increase, decrease, or stay the same when a train enters the tunnel? Briefly explain your reasoning.