

## COMP 6839 Problems

15. Compute the bipolar, with respect to the  $\xi$  variable, of  $f(u, \xi) = u^2 + (1 - \xi^2)^2$ .
- 16.
- (a) Verify that the expression in (3.8) of the text corresponds indeed to the divergence term in (3.7).
  - (b) Using the expressions for  $u_{TT}$  and  $u_{NN}$  below (3.8), verify that the right-hand sides of (3.39) and (3.40) are the same.
17. Verify that  $\phi(s) = \sqrt{1 + s^2}$  satisfies conditions (3.9) and (3.12).
- 18.
- (a) Use two of the example functions  $\phi$  in Table 3.1 to illustrate Proposition 3.2.2.
  - (b) (\*) Based on this, critique the proof of that proposition.
19. Verify that the energy  $E_\varepsilon(u)$  on p. 83 is convex for  $\varepsilon \geq \lambda/4$ .