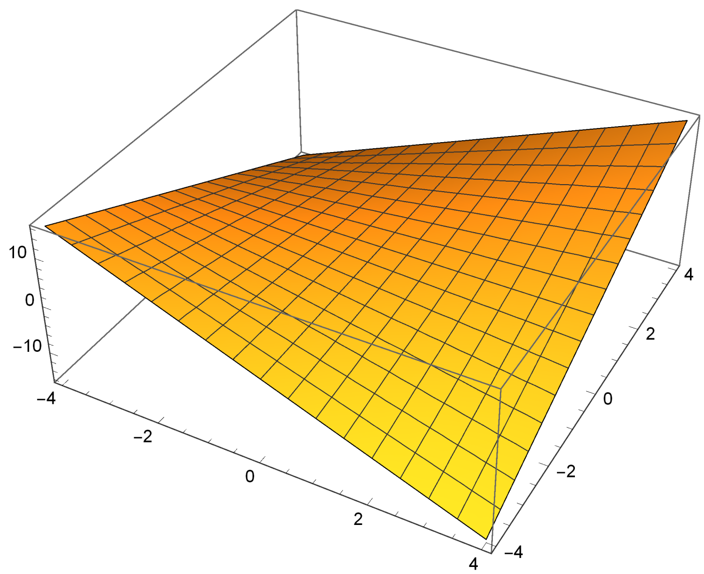
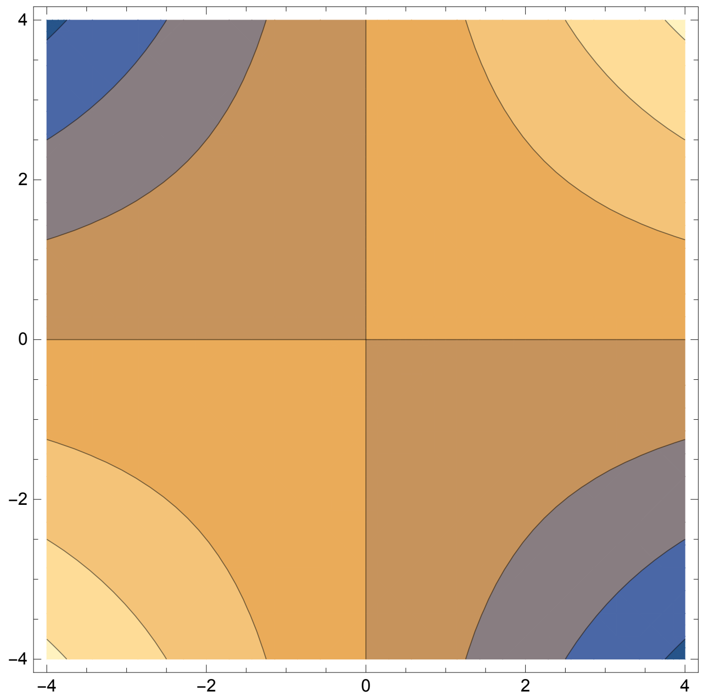
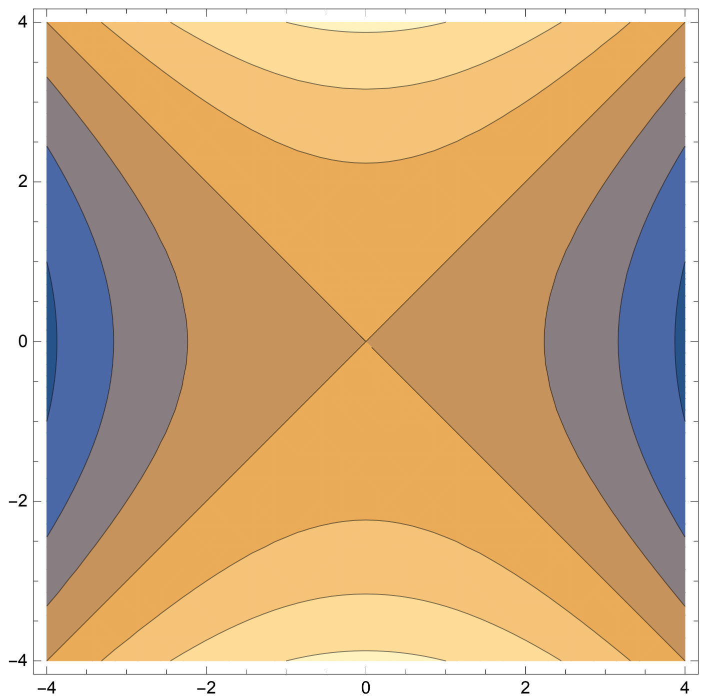
```
(* This is a minimal working example for Project 3, which asks us to analyze
  the level sets of a particular surface as well as the orthogonal trajectories.
   Here I work out the example for z = xy, starting with a 3D plot. *)

Plot3D[x * y, {x, -4, 4}, {y, -4, 4}]
```




```
(* Now for the level sets, which are hyperbolas given by xy = constant. *)
ContourPlot[x * y, {x, -4, 4}, {y, -4, 4}]
```


4
2
0
−2
−4
−4
−2
0
2
4

```
(* Next the orthogonal trajectories. The corresponding ODE is
  y'(t) / x'(t) = F_y / F_x = x(t) / y(t)
     This is separable. Rearranging as
     y y' - x x' = 0
      and integrating gives us the curves y^2 - x^2 = constant.
      I plotted the contours as well as a lot of curves for various
     initial conditions. *)
ContourPlot[y^2 - x^2, {x, -4, 4}, {y, -4, 4}]
```




```
(* And now some curves for both level sets and orthogonal trajectories. Notice
 that curves meet at right angles only, which is part of the definition of
 "orthogonal." *)
```

```
Plot[{1/x, 2/x, 3/x, 4/x, Sqrt[x^2], Sqrt[x^2 - 1], Sqrt[x^2 - 2],
  Sqrt[x^2 - 7], Sqrt[x^2 + 1], Sqrt[x^2 + 3], Sqrt[x^2 + 7]},
 {x, 0, 4}, PlotRange → {{0, 4}, {0, 4}}]
```