1. $\langle 6,7\rangle$; $\langle -7,6\rangle$ and $\langle 7,-6\rangle$.
2. $(2/\sqrt{13}, -3/\sqrt{13})$ and $(-2/\sqrt{13}, 3/\sqrt{13})$.
3. From the implicit function theorem, we know that if $\dfrac{\partial f}{\partial y} \neq 0$, then the zero set of f defines y as a function of x. Since, near $(0,0)$, the graph does not pass the vertical line test, y is not a function of x, so $\dfrac{\partial f}{\partial y} = 0$. Similarly, the graph does not pass the horizontal line test, so $\dfrac{\partial f}{\partial x} = 0$. Thus, $\vec{\nabla} f = \vec{0}$, so $(0,0)$ is a critical point.
4. When $y \neq 0$, then $\dfrac{\mathrm{d}y}{\mathrm{d}x} = -x/y$. When $x \neq 0$, $\dfrac{\mathrm{d}x}{\mathrm{d}y} = -y/x$.
5. See solutions.
6. $(0,0)$ as saddle, $(0,y)$ a minimum for $y \neq 0$.
7. (a) Yes. $g(x,y) = 0$ is a closed bounded region (the curve itself), so f must attain both a global max and a global min.
   (b)-(d) see graph
   (e) see solutions
   (f) no
   (g) $\langle 0,0\rangle$.
   (h) Some critical points may occur when $\vec{\nabla} g = \vec{0}$, if this point lies on the level set of g, so we always need to check points (if any) where this occurs.
8. Global mx $(2,3)$, global min $(-2,3)$ and $(2,-3)$.
9. 16
10. 1/6
11. 32
12. 2