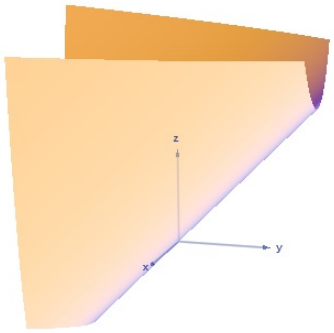
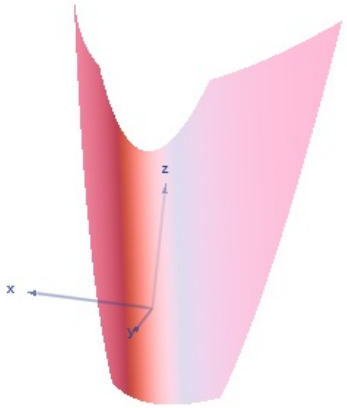
Math 32 – Workshop #28

1. Set $f(x,y) = y + x^2$.

   (a) On the given graph of $z = f(x,y)$ on the left, roughly sketch some traces and sketch some level curves. Label which are which. (*The graph on the right is just for added perspective.*)

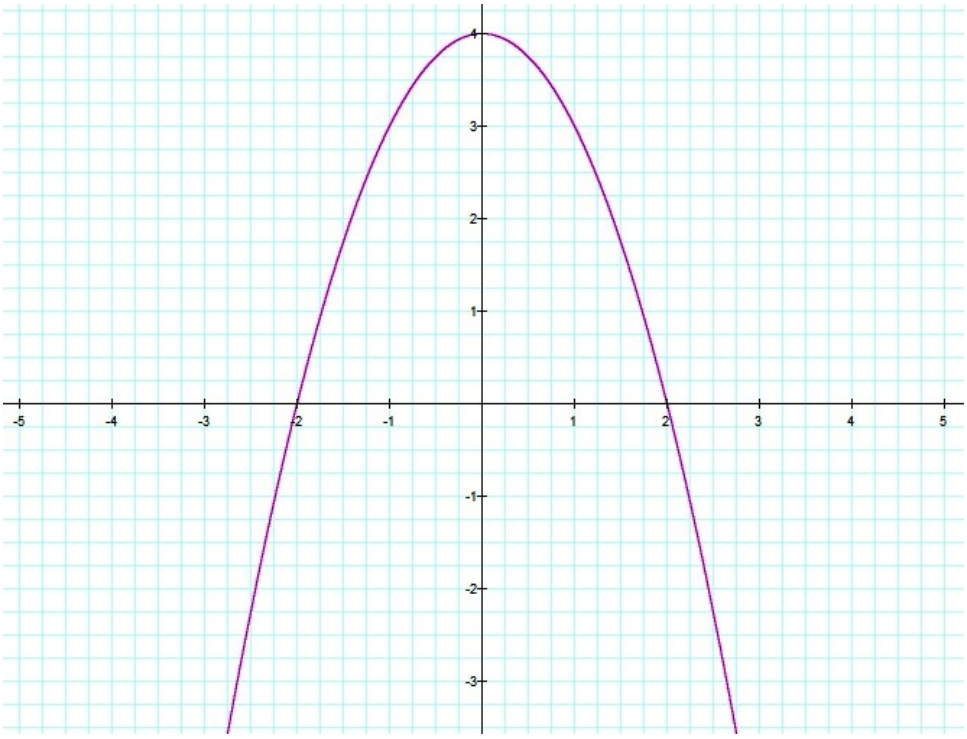




   (b) Now, compute the level curve for $k = 4$ and carefully (to scale) graph it in the appropriate dimension (*separate from the graphs above*). Sketch several more level curves.

   (c) We want to carefully graph some vectors in relation to our level curve for $k = 4$. At the point (x,y) on your level curve, we are going to graph the vector $\nabla f(x,y)$. To help you do this, first complete the chart, then graph the vectors on your level curve. What general relationship do the vectors have to the level curve?

(x,y)	$\nabla f(x,y)$	(x,y)	$\nabla f(x,y)$
(0,4)		(-1,3)	
(1,3)		(-2,0)	
(2,0)		(-3,-5)	
(3,-5)			



2. The gradient field of a function $f(x, y)$ is the vector field formed by $\vec{\mathbf{F}}(x, y) = \nabla f(x, y)$. Find and sketch the gradient field.

   (a) $f(x, y) = 2x - 4y$

   (b) $f(x, y) = 2xy$

   (c) $f(x, y) = 2x^2 + y^2$

   (d) $f(x, y, z) = y^2 + z^2$