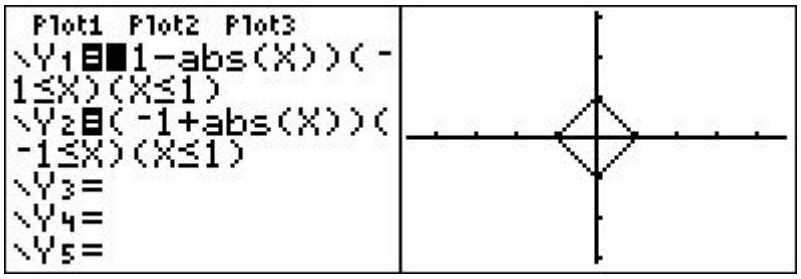
LEVEL CURVES 2 - ANSWERS

For each function below, draw the level curves corresponding to the given values of z. Use the same set of axes for each particular function, and correctly label all *x*- and *y*-intercepts.

1. $z = |x| + |y|$ $\qquad z = 1$

$1 = |x| + |y| \Rightarrow |y| = 1 - |x| \Rightarrow y = \pm(1 - |x|)$, *with* $-1 \le x \le 1$

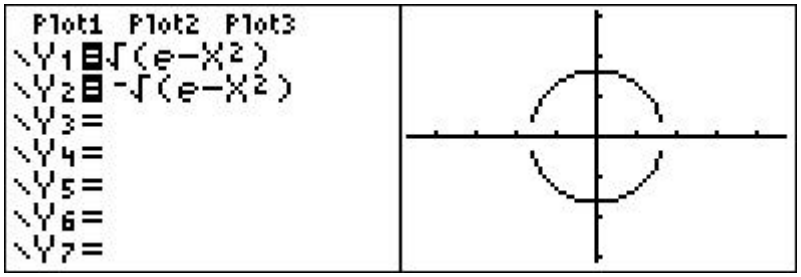


x-intercepts $= -1, 1$

y-intercepts $= -1, 1$

2. $z = \ln\left(x^2 + y^2\right)$ $\qquad z = 1$

$1 = \ln(x^2 + y^2) \Rightarrow e = x^2 + y^2 \Rightarrow y^2 = e - x^2 \Rightarrow y = \pm\sqrt{e - x^2}$

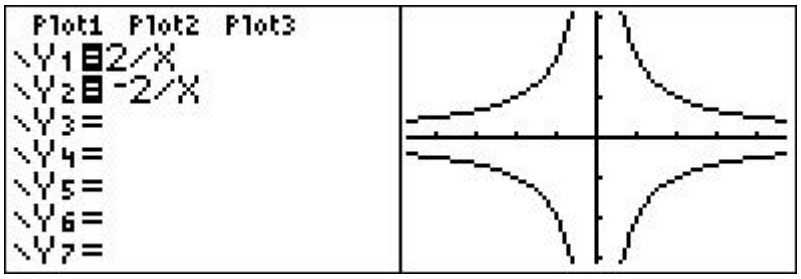


x-intercepts $= -\sqrt{e}, \sqrt{e}$

y-intercepts $= -\sqrt{e}, \sqrt{e}$

3. $z = x \cdot y$ $\qquad z = -2, 0, 2$

$k = xy \Rightarrow y = \dfrac{k}{x}, \quad 0 = xy \Rightarrow x = 0$ or $y = 0$

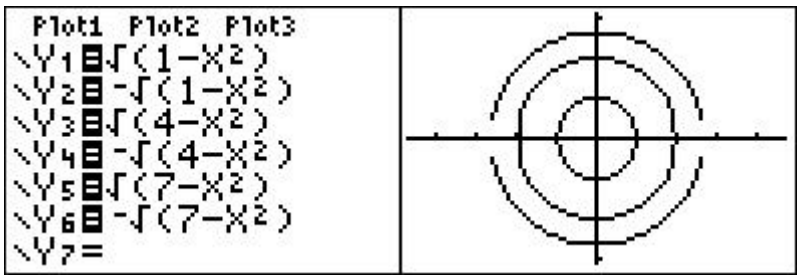


x-intercepts = all real numbers

y-intercepts = all real numbers

4. $z = x^2 + y^2$ $\qquad z = 1, 4, 7$

$k = x^2 + y^2 \Rightarrow y^2 = k - x^2 \Rightarrow y = \pm\sqrt{k - x^2}$

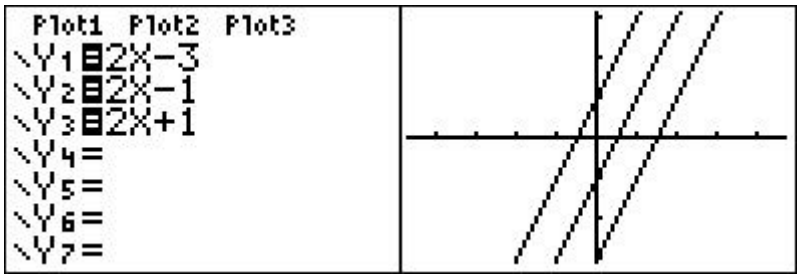


x-intercepts $= -1, 1, -2, 2, -\sqrt{7}, \sqrt{7}$

y-intercepts $= -1, 1, -2, 2, -\sqrt{7}, \sqrt{7}$

5. $z = -2x + y + 1$ $\qquad z = -2, 0, 2$

$k = -2x + y + 1 \Rightarrow y = 2x + k - 1$

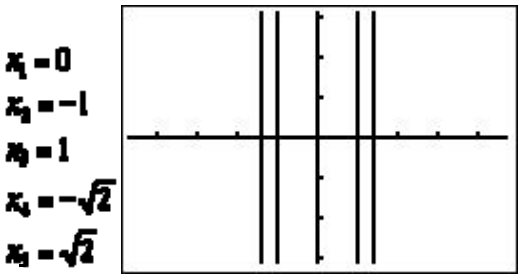


x-intercepts $= \dfrac{3}{2}, \dfrac{1}{2}, -\dfrac{1}{2}$

y-intercepts $= -3, -1, 1$

6. $z = x^2$ $z = 0, 1, 2$

$k = x^2 \Rightarrow x = \pm\sqrt{k}$

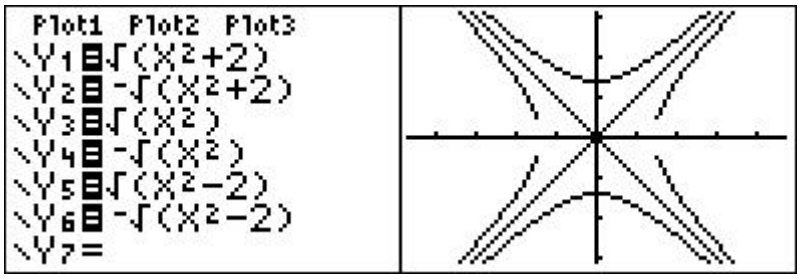


x-intercepts = $-\sqrt{2}, -1, 0, 1, \sqrt{2}$

y-intercepts = for x_1, all real numbers

7. $z = x^2 - y^2$ $z = -2, 0, 2$

$k = x^2 - y^2 \Rightarrow y^2 = x^2 - k \Rightarrow y = \pm\sqrt{x^2 - k}$



x-intercepts = $-\sqrt{2}, 0, \sqrt{2}$

y-intercepts = $-\sqrt{2}, 0, \sqrt{2}$