Graphing Practice

Math 130 *Kovitz*

For each equation, draw a rough graph. You will need to find and state:

- The quadrants in which the graph lies. The domain and range.
- The endpoints of the graph, if there are any.
- The maximum or minimum value or values, and for which x they occur.
- The exact coordinates of several—say six or seven—points on the graph.
- Any symmetries. Draw that line with its equation; or plot that point with its coordinates. They might not be any of our usual four cases.
- Whether the graph is connected (continuous), and its shape. (To find the shape, you might use algebra to find an alternate form of the equation.)
- Where the graph is increasing or decreasing, and its concavity.
- The exact coordinates of all intercepts. Then plot and label those intercepts.
- The equations of any asymptotes.

1. $xy^2 = 36$

2. $y = -|x + 7| + 4$

3. $y^2 = 5 - x^2$

4. $12 = \sqrt{x}\sqrt{y}$

ANSWERS follow.

ANSWERS

1. • The quadrants are the first and the fourth. The domain is all positive reals, and the range is all real numbers except 0.
   • This graph has no endpoints.
   • There is neither a maximum or minimum value.
   • Points on the graph: $(1, 6)$, $(1, -6)$, $(4, 3)$, $(4, -3)$, $(9, 2)$, $(9, -2)$..
   • The line of symmetry is the x-axis.
   • The graph consists of two connected curves of hyperbolic shape; and it is situated farily close to the relevant axes, Those axes are asymptotes.
   • The graph is increasing in the fourth quadrant and decreasing in the first. It is concave up in the first quadrant and concave down in the fourth.
   • There are no intercepts.
   • The y-axis: $x = 0$; and the positive x-axis: $y = 0$ and $x > 0$.

2. • The quadrants are the 2nd, 3rd, and 4th. The domain is all reals, and the range is all reals less than or equal to 4.
   • This graph has no endpoints.
   • The maximum value is 4, and it occurs when $x = -7$.
   • Other points on the graph:
     $(-20, -9)$, $(-5, 2)$, $(-4, 1)$, $(-2, -1)$, $\left(\frac{1}{2}, -3\frac{1}{2}\right)$, $(5, -8)$.
   • The line of symmetry is $x = -7$.
   • The graph is two connected rays, an increasing ray for $x > -7$, and a decreasing ray for $x > -7$.
   • The graph is increasing for $x > -7$ and decreasing for $x < -7$.
   • The intercepts are: $(-11, 0)$, $(-3, 0)$, and $(0, -3)$.
   • There are no asymptotes.

3. • The graph lies in all four quadrants. The domain and the range are both $\left[-\sqrt{5}, \sqrt{5}\right]$.
   • This graph has no endpoints.
   • The maximum and minimum values are $\pm\sqrt{5}$; they occur when $x = 0$.
   • Points on the graph:
     $\left(-\sqrt{5}, 0\right)$, $\left(-\sqrt{3}, -\sqrt{2}\right)$, $(-2, 1)$, $(1, 2)$, $\left(\frac{1}{2}\sqrt{10}, \frac{1}{2}\sqrt{10}\right)$, $(2, -1)$.
   • All four usual symmetries are present.
   • The graph is a circle with radius $\sqrt{5}$, centered at the origin. All circles have connected graphs.
   • The graph is increasing in quadrants 2 and 4, and decreasing in quadrants 1 and 3. It is concave up in the third and fourth quadrants and concave down in the first and second quadrants.
   • Intercepts; $\left(0, \pm\sqrt{5}\right)$, $\left(\pm\sqrt{5}, 0\right)$.
   • There are no asymptotes.

4.
- The graph lies in the first quadrant only. The domain and range are each the positive real numbers.
- There is no endpoint.
- There is no maximum or minimum value.
- Points on the graph: $(2, 72)$, $(4, 36)$, $(8, 18)$, $(16, 9)$, $(12, 12)$, $(144, 1)$.
- There are no symmetries.
- The graph is a single connected curve of hyperbolic shape; and the positive axes are asymptotes.
- The graph is decreasing and concave up.
- There are no intercepts.
- The asymptotes are the positive x- and y-axes..