Part I — Practice Problems

Math 130 *Kovitz*

Lines.

1. Find the equation and both intercepts. Sketch the line.

   (a) The line through $(2, -8)$ and $(-1, 10)$. Ans. $y = 4 - 6x$

   (b) The line through $(-1, -2)$ and $(4, 13)$. $y = 3x + 1$

   (c) The line through $(2, 3)$ and perpendicular to $3x + 6y = 1$. $y = 2x - 1$

2. Find the point of intersection of the lines having equations $2x + y = 0$ and $x - y = -3$. Sketch the lines, showing all intercepts. Ans. $(-1, 2)$

Circles. Determine the center and the radius of the circle with the given equation.

1. $x^2 + y^2 = 4x + 2y - 1$ Ans. $(2, 1)$; 2
2. $x^2 + 6x + y^2 = 0$ $(-3, 0)$; 3
3. $x^2 + 4y + y^2 = 2x - 2$ $(1, -2)$; $\sqrt{3}$

Odd/Even. Decide if the function with the given rule is odd, even, or neither.

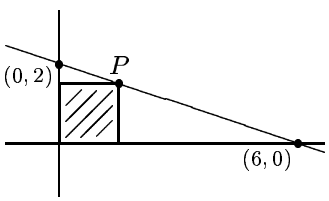
1. $x(x^2 + 1)$ 2. $\sqrt{1 - x^2}$ 3. $\dfrac{x^2}{1 + x^3}$ 4. $(x^3 + 1)(x^3 - 2)$ 5. $\dfrac{x^3 - x}{1 - x^2}$

Ans. 1. Odd 2. Even 3. Neither 4. Neither 5. Odd

Parabolas. Graph the quadratic function with the given rule: Complete the square and find the vertex and all intercepts, estimating as needed. Then sketch the function.

1. $f(x) = x^2 - 2x - 3$ Vertex. $(1, -4)$
2. $g(x) = x^2 + 2x - 2$ $(-1, -3)$
3. $h(x) = 3 - 4x - x^2$ $(-2, 7)$
4. $k(x) = 2x - x^2$ $(1, 1)$

Max-Min.

1. Find the area of the largest rectangular field that 2000 feet of fencing will enclose. Ans. 250,000 ft^2
2. A farmer makes a rectangular pen inside his barn with 40 feet of chicken wire, using a corner of the barn for two sides of the pen. Find the maximum area that he can enclose. Ans. 400 ft^2
3. Show that $x^2 + 6x + 10 > 0$ for all x. Ans. vertex is $(-3, 1)$, opens upward
4. Find the point on the line $x + 3y + 2 = 0$ closest to $(1, -2)$. Ans. $(1.3, -1.1)$
5. Show that $3 - x^2 - 4x < 8$ for all x. Ans. vertex is $(2, 7)$, opens downward
6. Find the point on the line $x - 2y = 1$ closest to $(0, 2)$. Ans. $(1, 0)$
7. 

For each point P on the line segment joining $(0, 2)$ and $(6, 0)$, consider the rectangle with upper right corner P and bounded by the axes, as in the sketch.
Among these rectangles, find the one of largest area. Ans. the rectangle with $P = (3, 1)$