

P-29 Find the intersection point(s) (if any) of each pair of parabolas. Make a sketch for each problem.

1. $y = x^2$ and $y = -x^2 + 8$

$$x^2 = -x^2 + 8$$

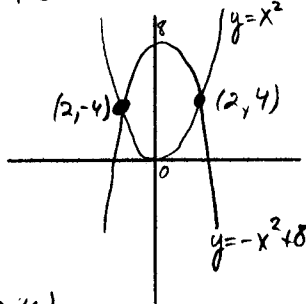
$$2x^2 = 8$$

$$x^2 = 4$$

$$\text{so } x = 2 \text{ or } x = -2$$

$$y = 4 \quad y = 4$$

intersection points are (2, 4) and (-2, 4)



3.

$y = x^2 + 1$ and $y = -x^2 - 1$

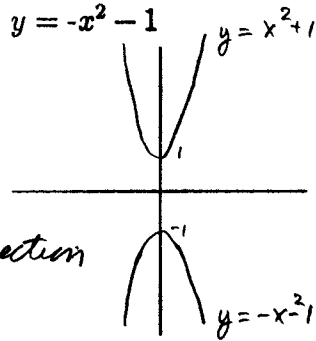
$$x^2 + 1 = -x^2 - 1$$

$$2x^2 + 1 = -1$$

$$2x^2 = -2$$

$$x^2 = -1$$

no intersection



2. $y = x^2 + 1$ and $y = -x^2 + 1$

4.

$$x^2 + 1 = -x^2 + 1$$

$$2x^2 + 1 = 1$$

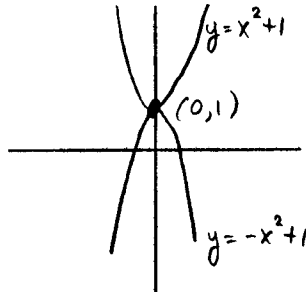
$$2x^2 = 0$$

$$x^2 = 0$$

$$x = 0$$

$$y = 1$$

intersection point is (0, 1)



$y = x^2 - 2x + 2$ and $y = 2x^2 - 4x + 2$

$$= (x-1)^2 + 1$$

$$x^2 - 2x + 2 = 2x^2 - 4x + 2$$

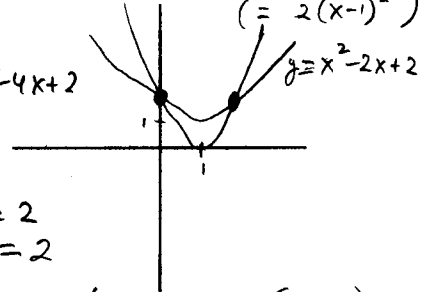
$$0 = x^2 - 2x$$

$$0 = x(x-2)$$

$$x = 0 \text{ or } x = 2$$

$$y = 2 \quad y = 2$$

intersection points are (0, 2) and (2, 2)



For each problem, decide if the required value exists. If it does then find it and where it occurs.

5. minimum of $x^2 + 2x + 1$

"U" $1 - \frac{4}{4} = 0$
 * min at vertex is $c - \frac{b^2}{4a} = 0$

6. maximum of $-x^2 - 4x + 3$

"∩" * max at vertex is $3 - \frac{16}{-4} = 7$

7. minimum of $-x^2 + 6x - 5$

"∩" * no min since opens down

8. maximum of $2x^2 + 12x + 8$

"U" * no max since opens up

Set up and solve each of the following problems. Be sure to find all possible answers.

9. Find two numbers whose difference is four and whose product is twenty-one.

let a and b be the #'s

$$a - b = 4 \text{ so } a = b + 4$$

$$a \cdot b = 21 \text{ so } (b+4)b = 21$$

$$b^2 + 4b = 21$$

$$b^2 + 4b - 21 = 0$$

$$(b+7)(b-3) = 0$$

$$\text{so } b = -7 \text{ or } b = 3$$

$$a = -3 \text{ or } a = 7$$

The #'s are 3 and 7 or -7 and -3.

10. Find two numbers whose sum is twelve and whose product is maximum.

let a and b be the #'s

$$a + b = 12 \text{ so } a = 12 - b$$

$$a \cdot b = (12 - b) \cdot b = -b^2 + 12b$$

↑ opens down

$$\text{no max when } b = \frac{-12}{-2} = 6$$

$$a = 6$$

The #'s are 6 and 6.