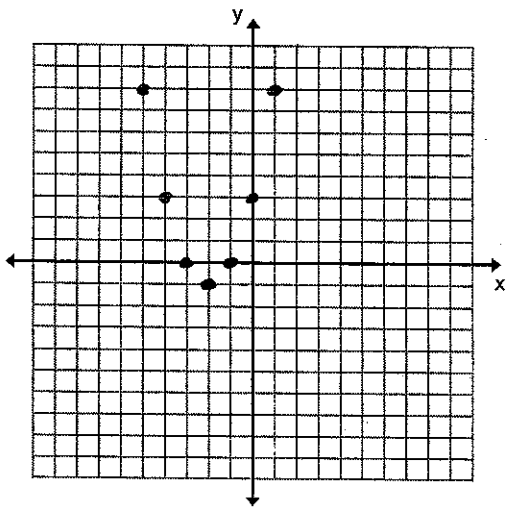
# Graph Transformations of $y = x^2$ Worksheet

| Equation | Vertex | Horizontal Shift R/L | Vertical Shift U/D | Opens Up or Down? | Narrows or Widens? | Axis of Symmetry | Domain | Range |
|---|---|---|---|---|---|---|---|---|
| 1. $y=-(x+6)^2-9$ | $(-6,-9)$ | L 6 | D 9 | DOWN | NO | $x=-6$ | $(-\infty,\infty)$ | $(-\infty,-9]$ |
| 2. $y=-x^2-5$ | $(0,-5)$ | NONE | D 5 | DOWN | NO | $x=0$ | $(-\infty,\infty)$ | $(-\infty,-5]$ |
| 3. $y=8(x+1)^2$ | $(-1,0)$ | L 1 | NONE | UP | NARROWS | $x=-1$ | $(-\infty,\infty)$ | $[0,\infty)$ |
| 4. $y=(x+3)^2-1$ | $(-3,-1)$ | L 3 | D 1 | UP | NO | $x=-3$ | $(-\infty,\infty)$ | $[-1,\infty)$ |
| 5. $y=-\frac{2}{5}(x-4)^2+3$ | $(4,3)$ | R 4 | U 3 | DOWN | WIDENS | $x=4$ | $(-\infty,\infty)$ | $(-\infty,3]$ |
| 6. $y=\frac{-3}{2}(x-1)^2+5$ | $(1,5)$ | R 1 | U 5 | DOWN | NARROWS | $x=1$ | $(-\infty,\infty)$ | $(-\infty,5]$ |
| 7. $y=\frac{1}{3}(x+2)^2$ | $(-2,0)$ | L 2 | NONE | UP | WIDENS | $x=-2$ | $(-\infty,\infty)$ | $[0,\infty)$ |
| 8. $y=x^2+1$ | $(0,1)$ | NONE | U 1 | UP | NO | $x=0$ | $(-\infty,\infty)$ | $[1,\infty)$ |
| 9. $y=\frac{6}{5}(x+1)^2-9$ | $(-1,-9)$ | L 1 | D 9 | UP | NARROWS | $x=-1$ | $(-\infty,\infty)$ | $[-9,\infty)$ |

Graph the function. Write the equation that represents the function.

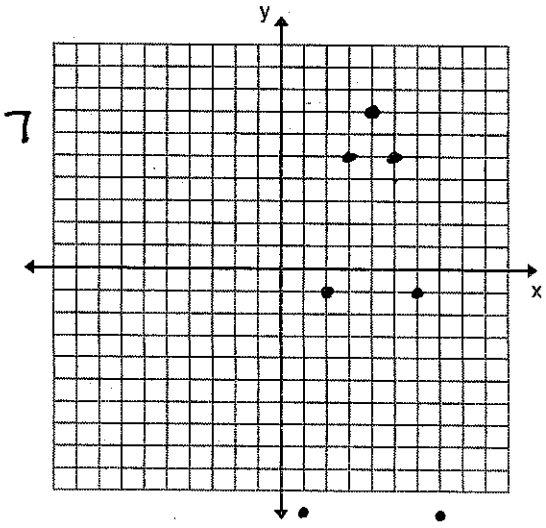
11. a = 1, Vertex (-2, -1)

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




12. a = -2, Vertex (4, 7)

$y=-2(x-4)^2+7$



**Completely factor the following polynomials. If it cannot be factored write Prime.**

11. $6x^2 + x - 15$

$x^2 + x - 90$

$(x + \frac{10}{6})(x - \frac{9}{6})$

$(3x + 5)(2x - 3)$

12. $-32x^2 + 36x - 10$

$-2(16x^2 - 18x + 5)$

$-2(x^2 - 18x + 80)$

$-2(x - \frac{10}{16})(x - \frac{8}{16})$

$-2(8x - 5)(2x - 1)$

13. $4x^2 + 8x - 48$

$4(x^2 + 2x - 12)$

14. $-27x^2 + 75$

$-3(9x^2 - 25)$

$-3(3x + 5)(3x - 5)$

15. $x^2 + x - 12$

$(x + 4)(x - 3)$

16. $4x^2 + 26x + 30$

$2(2x^2 + 13x + 15)$

$2(x^2 + 13x + 30)$

$2(x + \frac{10}{2})(x + \frac{3}{2})$

$2(x + 5)(2x + 3)$

17. $-2x^2 + 6x + 36$

$-2(x^2 - 3x - 18)$

$-2(x - 6)(x + 3)$

18. $36x^2 - 21x - 36$

$3(12x^2 - 7x - 12)$

$3(x^2 - 7x - 144)$

$3(x - \frac{16}{12})(x + \frac{9}{12})$

$3(3x - 4)(4x + 3)$

19. $50x^2 - 5x - 15$

$5(10x^2 - x - 3)$

$5(x^2 - x - 30)$

$5(x - \frac{6}{10})(x + \frac{5}{10})$

$5(5x - 3)(2x + 1)$

20. $-36x^2 + 6x - 20$

$-2(18x^2 - 3x + 10)$

$-2(x^2 - 3x + 180)$

$-2(x - \frac{15}{18})(x + \frac{12}{18})$

$-2(6x - 5)(3x + 2)$

21. $-3x^2 - 27x - 42$

$-3(x^2 + 9x + 14)$

$-3(x + 7)(x + 2)$

22. $15x^2 + 21x - 24$

$3(5x^2 + 7x - 8)$

$3(x^2 + 7x - 40)$

23. $24x^2 - 14x - 24$

$2(12x^2 - 7x - 12)$

$2(x^2 - 7x - 144)$

$2(x - \frac{16}{12})(x + \frac{9}{12})$

$2(3x - 4)(4x + 3)$

24. $24x^2 + 30x + 6$

$6(4x^2 + 5x + 1)$

$6(x^2 + 5x + 4)$

$6(x + \frac{4}{4})(x + \frac{1}{4})$

$6(x + 1)(4x + 1)$

25. $-36x^2 + 16x - 2$

$-2(18x^2 - 8x + 1)$