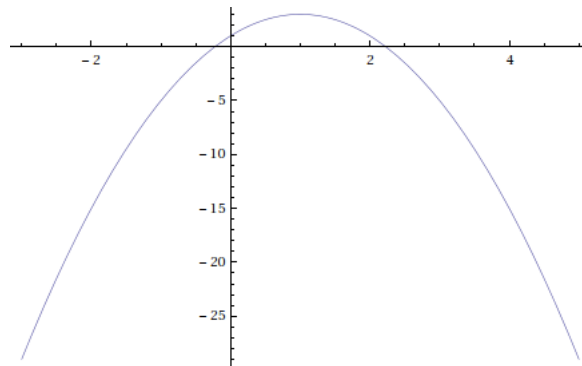


- 2.4.2** (a) Shift the graph to the left by 7 units.  
 (b) Shift the graph up 7 by units.

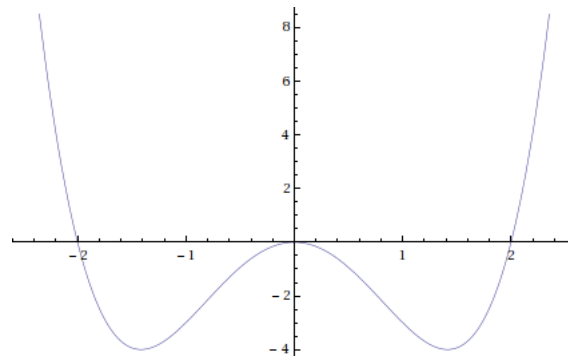
**2.4.27**  $f(x - 2) + 3 = (x - 2)^2 + 3 = x^2 - 4x^2 + 4 + 3 = x^2 - 4x + 7.$

**2.4.42** Start with the standard parabola  $f(x)$ . The desired graph is  $-2f(x - 1) + 3$ . That is:

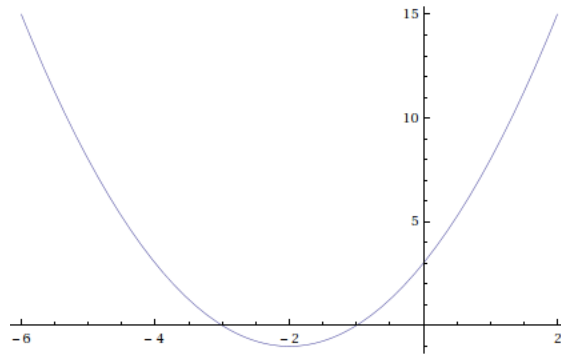
1. Shift the graph to the right 1 unit.
2. Flip the graph upside down.
3. Shrink vertically by a factor of  $\frac{1}{2}$ .
4. Shift upward by 3 units.



**2.4.64**  $f(-x) = (-x)^4 - 4(-x)^2 = x^4 - 4x^2 = f(x)$ , hence  $f$  is even.



- 2.5.9** (a)  $f(x) = x^2 + 4x + 3 = x^2 + 4x + 4 - 1 = (x + 2)^2 - 1.$   
 (b) Vertex:  $(-2, -1)$   
 $x$ -intercepts:  $(-3, 0), (-1, 0)$



**2.5.32**  $f(t) = 10t^2 + 40t + 113 = 10(t^2 + 4t) + 113 = 10(t^2 + 4t + 4 - 4) + 113 = 10(t^2 + 4t + 4) - 40 + 113 = 10(t + 2)^2 + 73$ , therefore 73 is the minimum value.