Section 2.5
Solutions and Hints

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for the book:

Precalculus, Mathematics for Calculus 4th Edition
by James Stewart, Lothar Redlin and Saleem Watson.

In this chapter be sure you know how to shift a function left, right, up and down.
You must also be able to scale a function vertically or horizontally (as well as reflect it about either the x or y axis).

You will also be expected to know what an even function is and what an odd function is.

And there are 3 types of symmetries to learn:

1. symmetric about the x-axis (odd function),
2. symmetric about the y-axis (even function) and
3. symmetric about the origin.

Most students forget what symmetric about the origin means. Look it up!

20. Given $f(x) = x^3$. Write the function which will transform it to be shifted down 1 unit and shifted 4 units to the left.

First we will obtain the shift 1 unit down by subtracting 1 from the entire function:

$g(x) = f(x) - 1 = x^3 - 1$

Now we will obtain the left shift of 4 units by ADDING 4 to the cubed part:

$h(x) = g(x + 4) = \mathbf{(x + 4)^3 - 1}$.

24. Given f(x) = | x |. Write the function which will transform it to be shifted left 1 unit and shifted 10 units upward and stretch it vertically by a factor of 3.

I would recommend ALWAYS doing the stretching FIRST, otherwise you will stretch your shifting also and that is bad (consider if you shift up 10 → | x | + 10 then stretch by 3, you would get | x | + 30 and your shift would be upwards 30, which would be wrong).

So first stretch vertically by a factor of 3 by multiplying the entire function by 3.

$g(x) = 3*f(x) = 3 * | x |$

Then shift upwards by 10 by adding 10 to the entire function.

$h(x) = g(x) + 10 = 3*| x | + 10$

Now shift left 1 unit by ADDING 1 to the x part.

$p(x) = h(x + 1) =$ **$3*| x + 1 | + 10$**.

54. Determine whether $f(x) = x^4 - 4x^2$ is even, odd or neither.

Recall:
If f(-x) = f(x) then a f(x) is even (and is symmetric about the y-axis).

If f(-x) = -f(x) then f(x) is odd (and is symmetric about the x-axis).

We are given: $f(x) = x^4 - 4x^2$ so we just need to calculate f(-x)

$f(-x) = (-x)^4 - 4*(-x)^2 = (-x)*(-x)*(-x)*(-x) - 4*(-x)*(-x) = x^4 - 4x^2$.

So f(x) is even and symmetric about the y-axis.

Notice you need to graph this function also.