

4.5 - Transformations of Polynomial Functions

For #1 - 4, describe the transformations that would produce the graph of the second function from the graph of the first function.

1. $f(x) = x^2$ becomes $f(x) = (x-3)^2 + 5$

move right 3, up 5

2. $f(x) = x^3$ becomes $f(x) = -3x^3 - 1$

move down 1
vert. stretch by 3
reflect across x-axis

3. $f(x) = x^4$ becomes $f(x) = \frac{1}{2}(x+1)^4 - 3$

move left 1, down 3
vert. shrink by $\frac{1}{2}$

4. $f(x) = x^2$ becomes $f(x) = -2(3x-2)^2 + 5$ ew.

reflect across x-axis
vert. stretch by 2
shift up 5. shift right $\frac{2}{3}$
horiz. shrink by $\frac{1}{3}$

5. Write the equation for the graph of function $g(x)$, obtained by shifting the graph of $f(x) = x^2$ three units left, stretching the graph vertically by a factor of two, reflecting that over the x-axis, and then translating the graph four units up.

$$f(x) = -2(x+3)^2 + 4$$

6. Write the equation for the graph of function $g(x)$, obtained by shifting the graph of $f(x) = x^4$ two units right and four units up.

$$f(x) = (x-2)^4 + 4$$

7. Determine the zeroes and their multiplicity, the end behavior, the points of extrema, the intervals over which the function is increasing and decreasing, and the intervals over which the function is positive and negative.

Zeros: $x = -4$ mult. 2
 $x = -\frac{1}{2}$ mult. 1
 $x = 5$ mult. 2

EB: as $x \rightarrow -\infty$ $f(x) \rightarrow -\infty$
as $x \rightarrow \infty$ $f(x) \rightarrow \infty$

Extrema: local max: $y = 0$ and 4
local min: $y = -1.5$ and 0
abs. min - none
abs. max - none

Inc: $(-\infty, -4) \cup (-2, 2) \cup (5, \infty)$

Dec: $(-4, -2) \cup (2, 5)$

Pos: $(-\frac{1}{2}, \infty)$
Neg: $(-\infty, -\frac{1}{2})$

