02-19-25 MTH 161-C06N

1.6 Graphs of Functions

1.6.2 Exercises

page 107: 1, 7, 9, 14, 21, 24, 32, 75

1.7 Transformations

1.7.1 Exercises

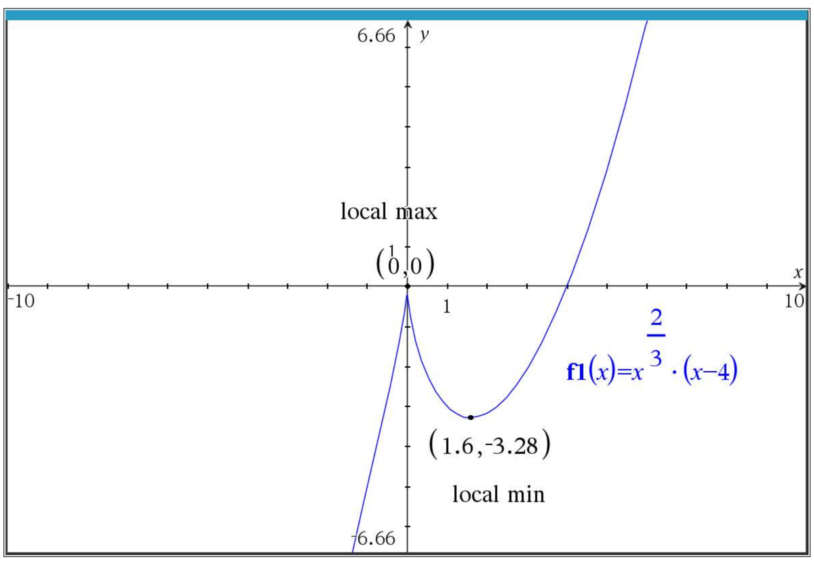
page 140: 1,4, 19, 24, 48, 56

1.6: 75

global

In Exercises 74 - 77, use your graphing calculator to approximate the local and absolute extrema of the given function. Approximate the intervals on which the function is increasing and those on which it is decreasing. Round your answers to two decimal places.

75. $f(x) = x^{2/3}(x-4)$



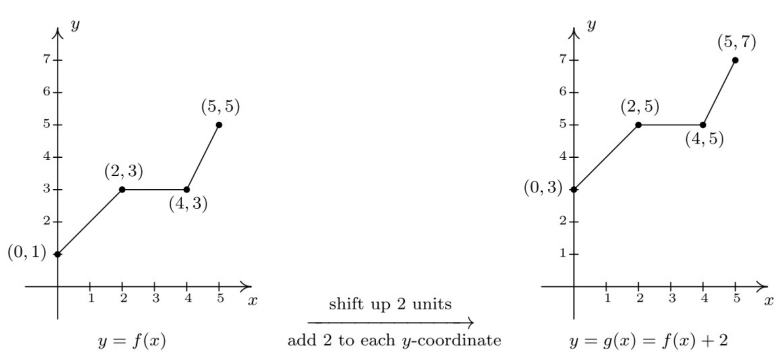
no global max

no global min

increasing on interval $(-\infty, 0)$, $(1.6, \infty)$

decreasing on interval $(0, 1.6)$

1.7



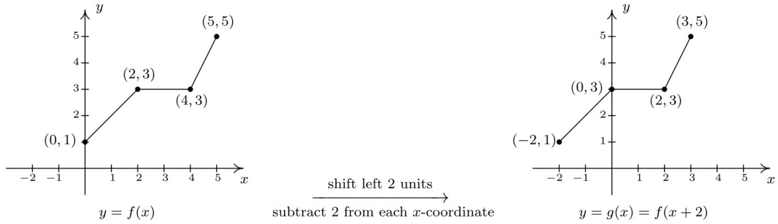
Memorize

Theorem 1.2. Vertical Shifts. Suppose f is a function and k is a positive number.

- To graph $y = f(x) + k$, shift the graph of $y = f(x)$ up k units by adding k to the y-coordinates of the points on the graph of f.

Theorem 1.2. Vertical Shifts. Suppose f is a function and k is a positive number.

- To graph $y = f(x) + k$, shift the graph of $y = f(x)$ up k units by adding k to the y-coordinates of the points on the graph of f.
- To graph $y = f(x) - k$, shift the graph of $y = f(x)$ down k units by subtracting k from the y-coordinates of the points on the graph of f.



Memorize

Theorem 1.3. Horizontal Shifts. Suppose f is a function and h is a positive number.

- To graph $y = f(x + h)$, shift the graph of $y = f(x)$ left h units by subtracting h from the x-coordinates of the points on the graph of f.
- To graph $y = f(x - h)$, shift the graph of $y = f(x)$ right h units by adding h to the x-coordinates of the points on the graph of f.

Memorize

Theorem 1.6. Horizontal Scalings. Suppose f is a function and $b > 0$. To graph $y = f(bx)$, divide all of the x-coordinates of the points on the graph of f by b. We say the graph of f has been horizontally scaled by a factor of $\frac{1}{b}$.

- If $0 < b < 1$, we say the graph of f has undergone a horizontal stretching (expansion, dilation) by a factor of $\frac{1}{b}$.
- If $b > 1$, we say the graph of f has undergone a horizontal shrinking (compression, contraction) by a factor of b.

Supplied

Theorem 1.7. Transformations. Suppose f is a function. If $A \neq 0$ and $B \neq 0$, then to graph

$$g(x) = Af(Bx + H) + K$$

1. Subtract H from each of the x-coordinates of the points on the graph of f. This results in a horizontal shift to the left if $H > 0$ or right if $H < 0$.
2. Divide the x-coordinates of the points on the graph obtained in Step 1 by B. This results in a horizontal scaling, but may also include a reflection about the y-axis if $B < 0$.
3. Multiply the y-coordinates of the points on the graph obtained in Step 2 by A. This results in a vertical scaling, but may also include a reflection about the x-axis if $A < 0$.
4. Add K to each of the y-coordinates of the points on the graph obtained in Step 3. This results in a vertical shift up if $K > 0$ or down if $K < 0$.

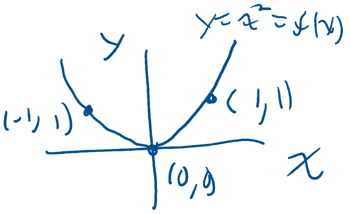
A, B, H, k are constants

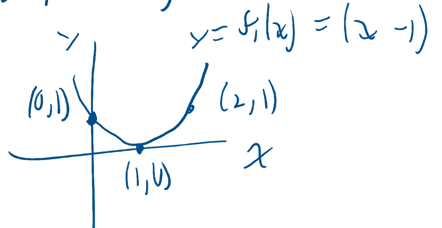
Let $f(x) = x^2$

$g(x) = (x-1)^2 + 3$

$A = 1$
$B = 1$
$H = -1$
$k = 3$

use Thm 1.7 to graph $g(x)$





1) (-1, 1) | (0, 0) | ( ), 1)

1) $(-1, 1)$	$(0, 0)$	$(1, 1)$
$(-1-(-1), 1)$	$(0-(-1), 0)$	$(1-(-1), 1)$
$= (0, 1)$	$= (1, 0)$	$= (2, 1)$
2) $(\frac{0}{1}, 1)$	$(\frac{1}{1}, 0)$	$(\frac{2}{1}, 1)$
$= (0, 1)$	$(1, 0)$	$(2, 1)$
3) $(0, 1)$	$(1, 0)$	$(2, 1)$
4) $(0, 1+3)$	$(1, 0+3)$	$(2, 1+3)$
$(0, 4)$	$(1, 3)$	$(2, 4)$