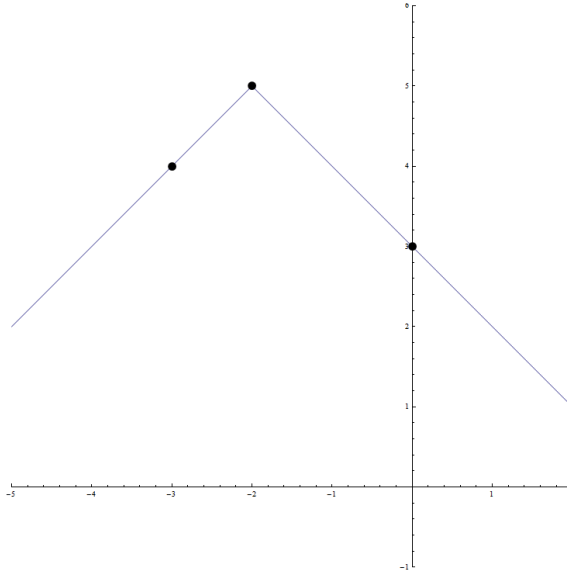


YOUR NAME: _____

George Voutsadakis

Read each problem **very carefully** before starting to solve it. Each problem is worth 10 points. It is necessary to show **all** your work. Correct answers without explanations are worth 0 points. **GOOD LUCK!!**

1. (a) The following figure shows a transform of $y = |x|$. Give a step-by-step list of transformations that need to be performed in order to obtain a formula for the graph shown.



$$y = |x| \longrightarrow (\quad \quad \quad)$$

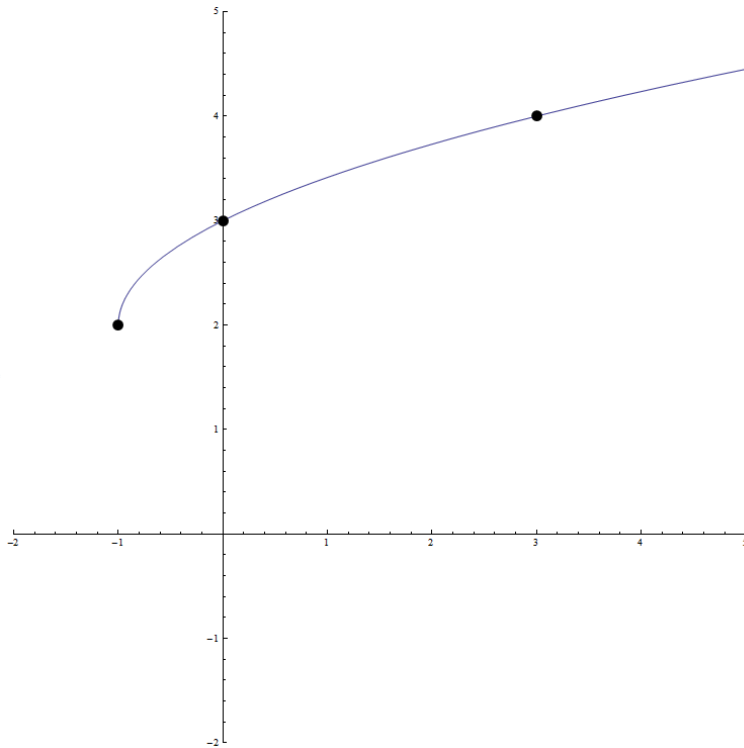
$$\longrightarrow (\quad \quad \quad)$$

$$\longrightarrow (\quad \quad \quad)$$

- (b) Solve the absolute value equation $|7x + 10| - 15 = 30$.

2. (a) Check whether $f(x) = \frac{1}{x+2} - 3$ and $g(x) = \frac{1}{x+3} - 2$ are inverse functions.

- (b) Consider the function $f(x) = \sqrt{x+1} + 2$, whose graph is shown below. Find a formula for $f^{-1}(x)$ and graph $y = f^{-1}(x)$ on the same system of coordinate axes.



3. (a) A line ℓ_1 passes through the points $(-5, 20)$ and $(2, -35)$. Find an equation for a line ℓ_2 that is perpendicular to ℓ_1 and passes through the point $(1, 7)$.

- (b) A water reservoir holds 800 gallons of water at 8:00 am. By 5:00 pm the level has gone down to 530 gallons.

- (i) Assuming a linear trend in water consumption, find an equation for the amount W of water remaining in the reservoir t hour after 8:00 am.

- (i) When will the entire water supply available in the reservoir be exhausted?

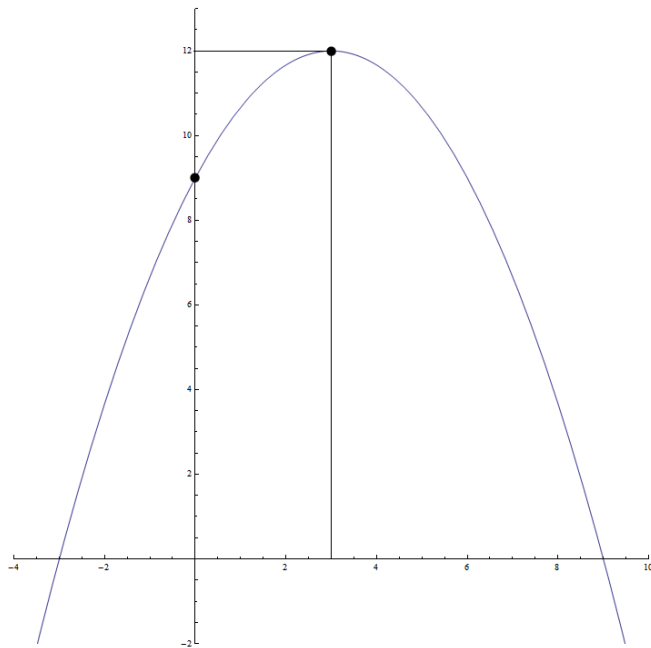
4. (a) Let $f(x) = -x^2 + 8x - 7$. Find the following showing all work.
The location of the vertex.

The opening direction.

The y -intercept.

The x -intercepts.

- (b) The following figure show the graph of a quadratic function $y = f(x)$. Find an equation for $f(x)$.



5. A football stadium holds 62,000 spectators. With a ticket price of \$11, the average attendance has been 26,000. When the price dropped to \$9, the average attendance rose to 31,000.
- (a) Assuming that attendance n is linearly related to ticket price p , find an equation modelling $n(p)$.

- (b) Find the ticket price that would maximize the venue's revenue.