Exam Review Part 2b – Transformations of Functions

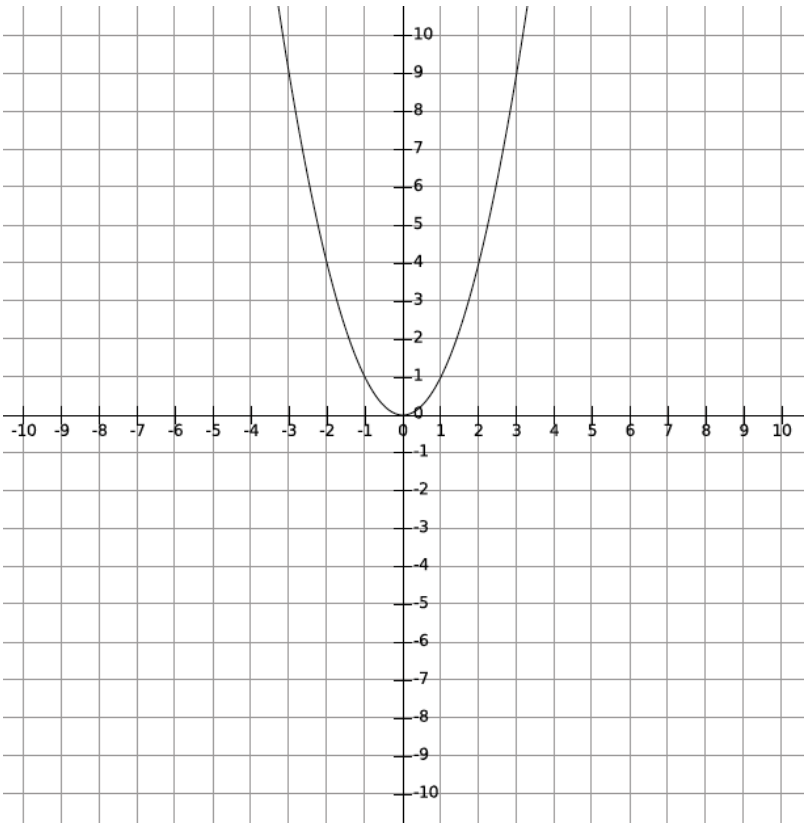
MCR3U

Section 1: Transformations of $f(x) = x^2$, $f(x) = \sqrt{x}$, and $f(x) = \frac{1}{x}$

1) Below is the graph of $f(x) = x^2$. Describe the transformations to a) and b) and use transformations to graph them.

a) $f(x) = -(x+6)^2 + 4$

b) $f(x) = \left(-\frac{1}{2}x\right)^2 - 3$



2) For the function $f(x) = \sqrt{x}$, write the new function equation for each transformation.

a) translation up 4 and right 9.

b) vertical stretch by 6 and translation left 5.

c) horizontal reflection in the y-axis and horizontal compression by $\frac{1}{4}$.

3) Write the new function for the following description, given that the transformations are applied to the parent function $f(x) = x^2$.

Vertical stretch by 2, horizontal stretch by 3, vertical reflection over the x-axis, a vertical translation 2 units up and a horizontal translation 6 units left.

4) List all the transformations, in words, of f(x) for each of the following functions.

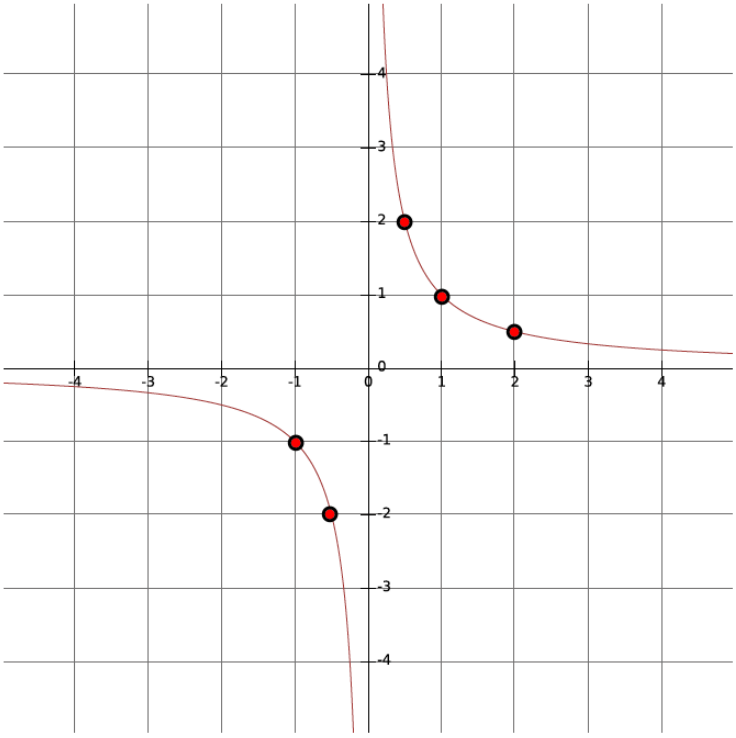
a) $g(x) = -f(x-3) - 4$

b) $h(x) = -\frac{1}{3}f(2x) + 10$

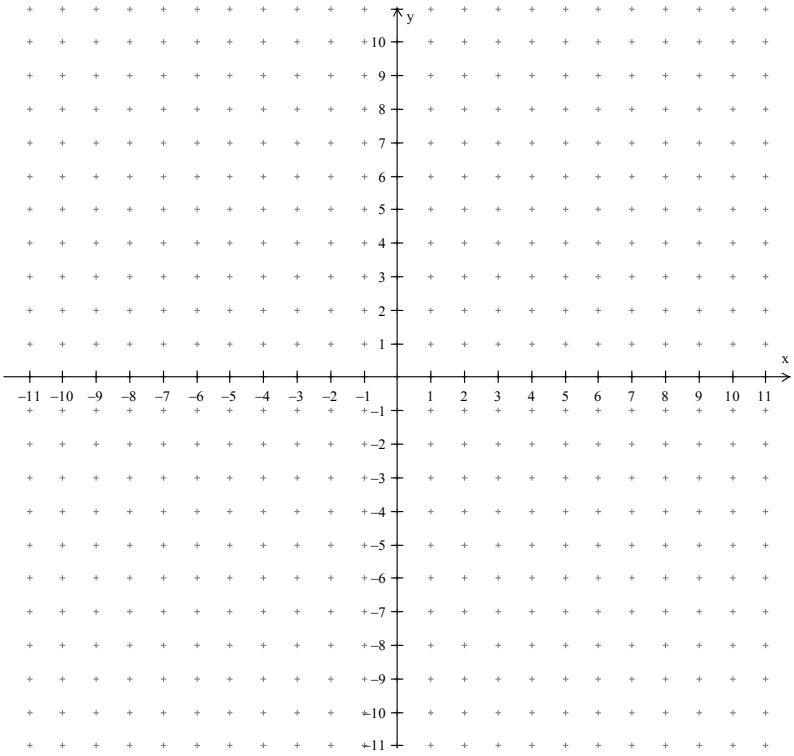
c) $j(x) = 5f(x+4) - 5$

d) $k(x) = -2f\left(-\frac{1}{6}x\right) + 6$

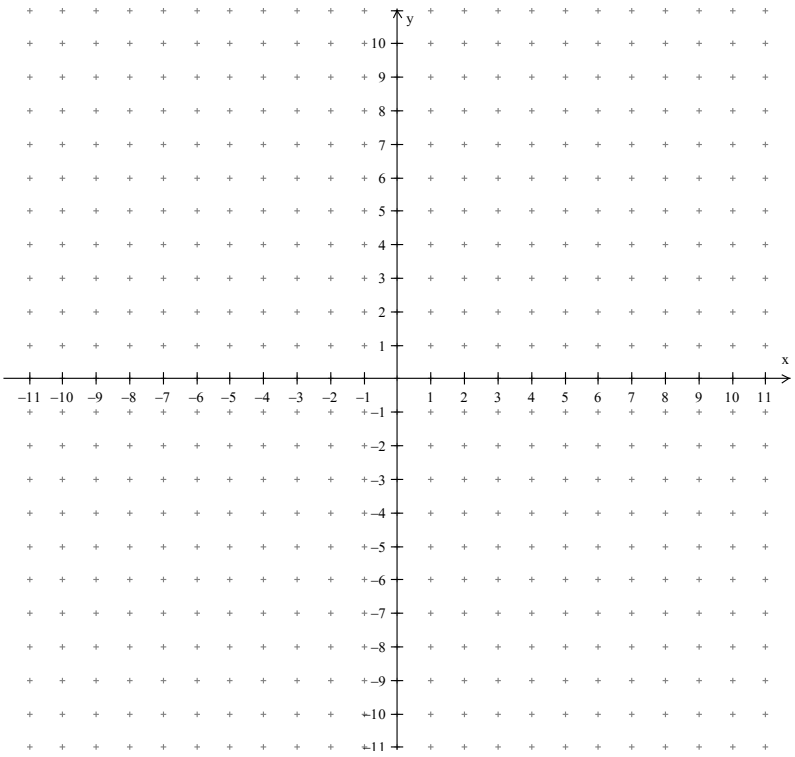
5) Graph $g(x) = \frac{1}{2}f(x+1) - 1$ using transformations to the function $f(x) = \frac{1}{x}$ that is shown.



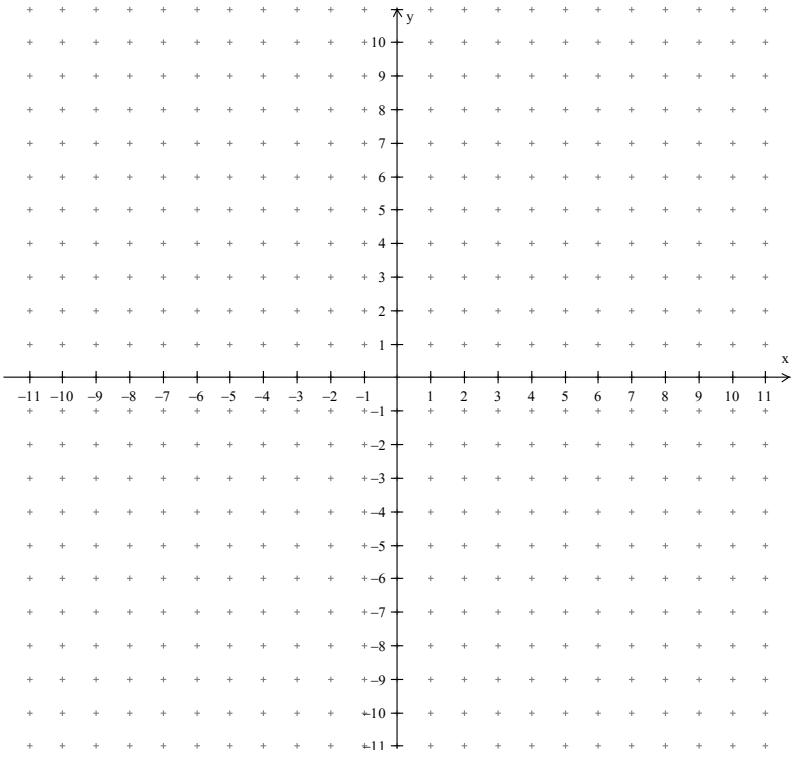
6) $f(x) = \sqrt{x}$. Graph $g(x) = 2f(-2x) - 3$ using transformations.



7) Graph the parent function of $g(x) = \frac{1}{2}(x-2)^2 + 5$ and $g(x)$ using transformations.



8) Graph the parent function of $h(x) = \frac{1}{2}\sqrt{2x} - 3$ and $h(x)$ using transformations.



Section 2: Inverse of a Function

9) For each function listed below, determine the equation of the inverse, $f^{-1}(x)$.

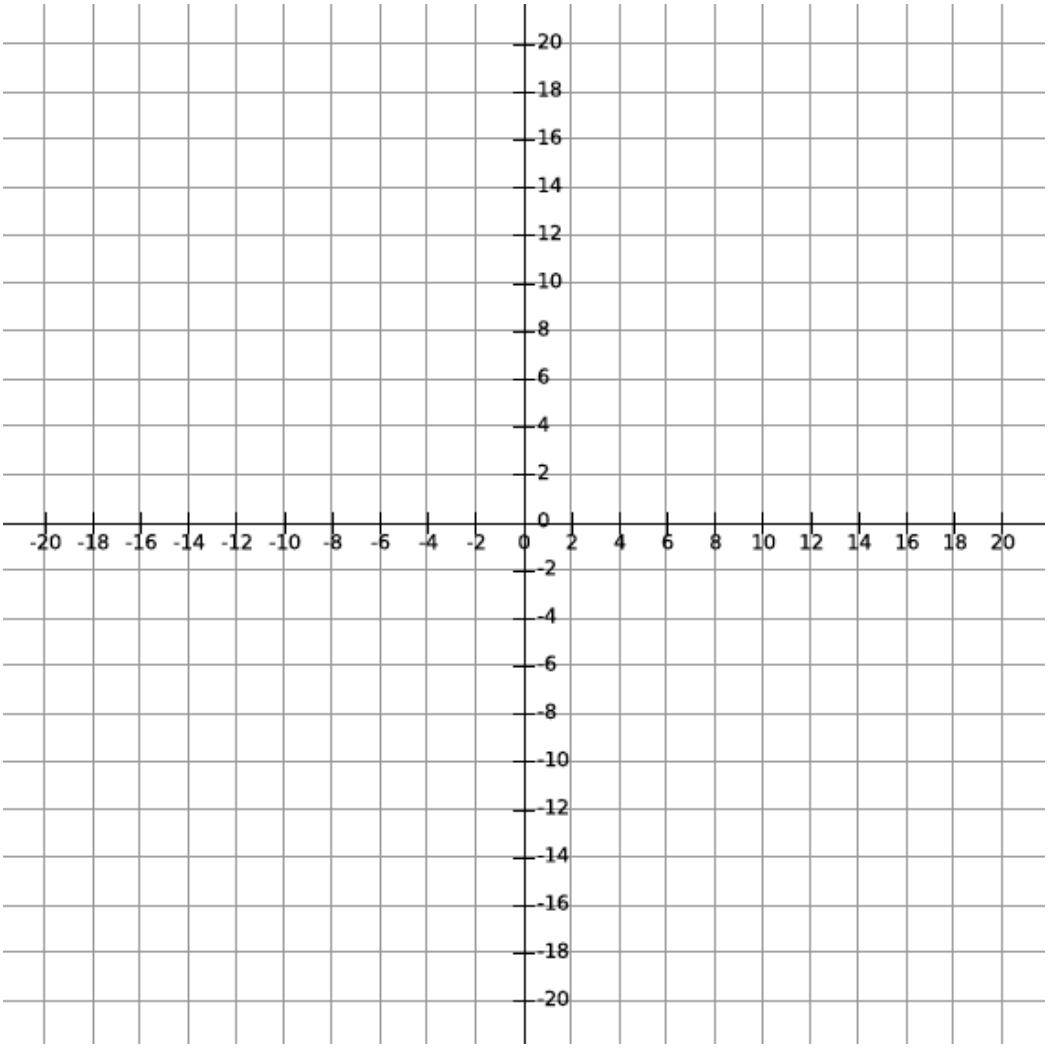
a) $f(x) = 3x + 9$

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

10) Determine the equation of the inverse of $f(x) = 2x^2 + 16x + 30$ by first completing the square.

11) Calculate the inverse of $f(x) = 2(x - 1)^2 + 2$.

12) Graph $f(x)$ from the previous question and its inverse below.



Answers

1) see posted solutions

2) a) $g(x) = \sqrt{x-9} + 4$ **b)** $g(x) = 6\sqrt{x+5}$ **c)** $g(x) = \sqrt{-4x}$

3) $g(x) = -2\left|\frac{1}{3}(x+6)\right|^2 + 2$

4) a) vertical reflection, right 3 units, down 4 units
b) vertical reflection, vertical compression bafo $\frac{1}{3}$, horizontal compression bafo $\frac{1}{2}$, up 10 units
c) vertical stretch bafo 5, left 4 units, down 5 units
d) vertical reflection, vertical stretch bafo 2, horizontal reflection, horizontal stretch bafo 6, up 6 units

5) through **8)** check posted solutions

9) a) $f^{-1}(x) = \frac{x-9}{3}$ **b)** $f^{-1}(x) = \pm\sqrt{3(x+4)}$

10) $f^{-1}(x) = -4 \pm \sqrt{\frac{x+2}{2}}$

11) $f^{-1}(x) = 1 \pm \sqrt{\frac{x-2}{2}}$

12) See posted solutions