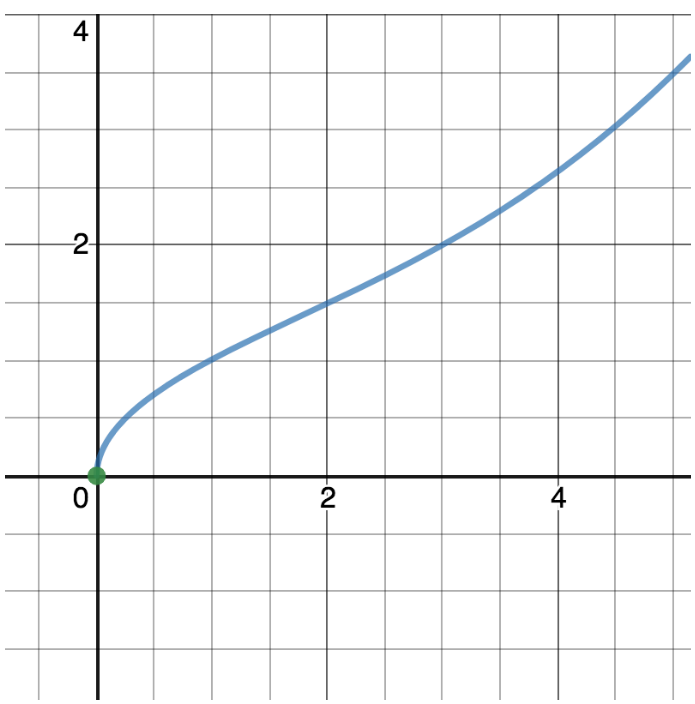
Prof. Jonas Reitz
City Tech, Spring 2020
MAT 1375 Precalculus

Exam 1 Review

The exam covers material from Chapters 1-7

CORRECTIONS 2/23/20: The answers to questions 1b, 8c and 9c have been updated.

1. Solve each inequality. Give your answer in interval notation.
   a. $|2x - 3| > 6$
   b. $|x + 2| \leq 10$
   c. $|x| \leq -3$
2. Find an equation of the line
   a. passing through the points $(7, -2)$ and $(-3, 7)$.
   b. with slope $2/5$ and y-intercept $(0, -2)$.
3. In your own words, explain what a *function* is.
4. The figure below shows the graph of a function $f(x)$. Use the figure to answer the following questions:
   a. Is the function shown in the graph one-to-one? Why or why not?
   b. Sketch a graph of the function $y = -f(x + 3)$.
   c. Sketch a graph of the function $y = f(-x) + 4$.
   d. Evaluate $f(2)$
   e. Evaluate $-2 \cdot f(3) - 2$
   f. Evaluate $f^{-1}(2)$
   g. Evaluate $f(f(3))$



Problems #5-9 refer to the functions $f(x) = \sqrt{2x - 6}$, $g(x) = x - 5$, and $j(x) = \frac{1}{2x+1}$

5. Find the domain and range of each of the functions $f(x)$, $g(x)$ and $j(x)$ (you may determine the range of the function based on the graph).
6. Find and simplify the difference quotient:
   a. $\frac{g(a+h)-g(a)}{h}$
   b. $\frac{f(a+h)-f(a)}{h}$
7. The graph of the function $f(x)$ is shifted up 3 units and to the right 4 units. Find and simplify the formula for this new function.
8. Find and simplify each new function and state the domain:
   a. $(g + j)(x)$
   b. $\left(\frac{f}{g}\right)(x)$
   c. $(f \circ g)(x)$
9. Find and simplify the inverse:
   a. $f^{-1}(x)$
   b. $g^{-1}(x)$
   c. $j^{-1}(x)$

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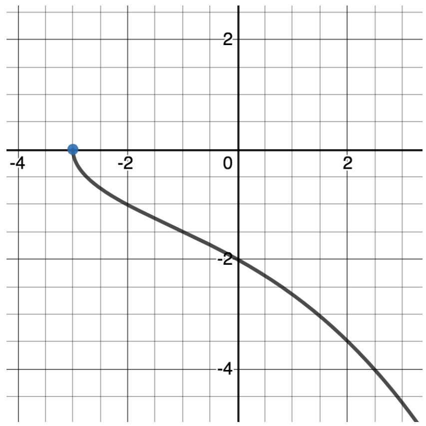
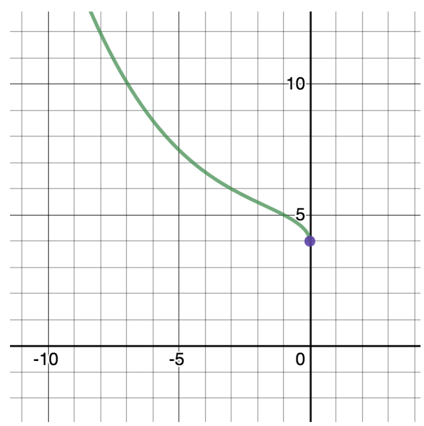
Exam 1 Review - Answer Key

If you have questions or find an error, please tell me in class or email me at jreitz@citytech.cuny.edu.

1. a. $\left(-\infty, -\frac{3}{2}\right) \cup \left(\frac{9}{2}, \infty\right)$ b. $[-12, 8]$ c. no solutions
2. a. $y = -\frac{9}{10}x + \frac{43}{10}$ b. $y = \frac{2}{5}x - 2$
3. *This should be in your own words - if you want to give an explanation in terms of inputs and outputs, that would be fine.*
4. a. Yes, because each output y has at most one input x (that is, the graph passes the **horizontal line test**).

   b. 

   c. 

   d. $f(2) = 1.5$ e. $-2 \cdot f(3) - 2 = -2(2) - 2 = -4 - 2 = -6$

   f. $f^{-1}(2) = 3$ g. $f(f(3)) = f(2) = 1.5$
5. a. $f(x) = \sqrt{2x - 6}$, domain $D_f = [3, \infty)$, range $R_f = [0, \infty)$

   b. $g(x) = x - 5$, domain $D_g = \mathbb{R}$ or $(-\infty, \infty)$, range $R_g = \mathbb{R}$ or $(-\infty, \infty)$

   c. $h(x) = \frac{1}{2x+1}$, domain $D_h = (-\infty, -\frac{1}{2}) \cup (-\frac{1}{2}, \infty)$, range $R_h = (-\infty, 0) \cup (0, \infty)$
6. a. $\frac{g(a+h)-g(a)}{h} = 1$ b. $\frac{f(a+h)-f(a)}{h} = \frac{2}{\sqrt{2(a+h)-6}+\sqrt{2a-6}}$
7. $f(x - 4) + 3 = \sqrt{2x - 14} + 3$
8. a. $(g + h)(x) = \frac{2x^2-9x-4}{2x+1}$, domain $D_{(g+h)} = (-\infty, -\frac{1}{2}) \cup (-\frac{1}{2}, \infty)$

   b. $\left(\frac{f}{g}\right)(x) = \frac{\sqrt{2x-6}}{x-5}$, domain $D_{\frac{f}{g}} = [3, 5) \cup (5, \infty)$

   c. $(f \circ g)(x) = \sqrt{2x - 16}$, domain $D_{f \circ g} = [8, \infty)$
9. a. $f^{-1}(x) = \frac{1}{2}x^2 + 3$ b. $g^{-1}(x) = x + 5$ c. $j^{-1}(x) = \frac{1-x}{2x}$