

Use white paper provided, to do all your work. These question pages should only have your name on top. That's it. If you get stuck on a problem, start a fresh sheet of paper and come back to it, if time permits.

It is important that your work be submitted in the same order as the questions asked. I will not go on a treasure hunt, looking for work that is out of sequence. Put your scratch work WITH your work, so it's all there. If #5 isn't between #s 4 and 6, I won't find it.

Leave extra space. Add a "121 Test 2" header in big letters at the top of every page (i.e., LEAVE A MARGIN!)

1. Consider the relation $f = \{(-2,3), (1,1), (2,2), (3,3)\}$.
 - a. (5 pts) Is f a function?
 - b. (5 pts) What is the domain of f ?
 - c. (5 pts) What is the range of f ?
 - d. (5 pts) Is f one-to-one? If not, explain why not.

2. Let $f(x) = \frac{x+11}{x-2}$ and $g(x) = \sqrt{x+7}$ and .
 - a. (5 pts) Write the function $\frac{f}{g}$. Do not simplify.
 - b. (5 pts) What is the domain of $\frac{f}{g}$? Give your answer in set notation and interval notation.
 - c. (5 pts) Write the function $f \circ g$. Do not simplify.
 - d. (5 pts) What is the domain of $f \circ g$? Give your answer in set notation and interval notation.

3. (5 pts) Simplify the difference quotient for $f(x) = 3x^2 - 2x$.

4. (5 pts) Draw a picture for the difference quotient for $f(x) = \sqrt[3]{x}$. Describe what the difference quotient represents, in words. Do not simplify your difference quotient.

5. Let $g(x) = 4\sqrt{-5x - 10} - 7$.
- (10 pts) Sketch the graph of $g(x)$, by transforming the basic function $f(x) = \sqrt{x}$. I want to see 3 points labeled in the graph of g – preferably starting with $(0,0)$, $(1,1)$ and $(4,2)$ – and track where those points are moved to after every step, as demonstrated in class and/or video.
 - (5 pts) State the domain and range of $g(x)$, based on your final graph.
 - (5 pts) Find the x - and y -intercept of $g(x)$, and label them, clearly, on the graph.
6. (10 pts) Sketch the graph of $r(x) = -2(x+5)^2 + 3$ by transforming the basic function $f(x) = x^2$. I want to see 3 points labeled in the graph of f , and I want you to track where those points are moved to after every step, as demonstrated in class and/or video.
7. (5 pts) Find the x - and y -intercepts and add them to your final sketch, above. For x -intercept, leave final answer in simplified radical form.
8. (5 pts) Given that $f(x) = \sqrt[3]{2x+8}$, find $f^{-1}(x)$.
9. (10 pts) Write an equation for the inverse-square law for the intensity of sound (or light). The inverse-square law states “The intensity of sound is inversely proportional to the square of the distance from the source.” Identify variables, and put some words around it, if you want full credit.

Answer two of the following for **Bonus** (5 pts each)

B1: Simplify the difference quotient for the function $f(x) = \frac{1}{\sqrt{x}}$. Then pass to the limit, as h approaches zero.

B2: Complete the square to re-write the function $h(x) = 7x^2 - 11x + 3$ in the form $a(x-h)^2 + k$.

B3: What is the domain of $r(x) = \frac{x^{77} - 5x^{12} + 17}{x^2 + 5x + 7}$?

B4: Graph the piecewise-defined function $f(x) = \begin{cases} x^2 - 1 & \text{if } x < 2 \\ x + 3 & \text{if } x \geq 2 \end{cases}$

B5: Write the function $g \circ f$. What is the domain of $g \circ f$?

B6: John can do a job in 6 hours that takes Bob 10 hours. Suppose John comes in 2 hours early on the day they were to work together. How many hours does Bob end up working, if they work together from the time he arrives? How many hours does John end up working that day?

