

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 $f = \{(-2,3), (1,5), (2,8), (3,-2)\}$.
 - 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 $f(x) = \frac{x+2}{x-3}$ and $g(x) = \sqrt{x+4}$ 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 $f(x) = 3x^2 - 5x$.



Bonus (5 pts) Pass to the limit as h approaches zero, and show me some calculus to go with #4.

4. (5 pts) Draw a picture for the difference quotient for $f(x) = x^2$. Describe what the difference quotient represents, in words. Do not simplify your difference quotient. That's a bonus problem, later on.

5. Let $g(x) = -3\sqrt{-7x+14} + 5$.
- (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.
 - (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 $r(x) = -2(x+6)^2 + 8$ 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.
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) Prove that $f(x) = \frac{x+7}{x-11}$ is one-to-one.
9. (5 pts) Suppose y is jointly proportional to the cube root of x and the cube of z , and inversely proportional to the square root of u and the square of w . Write an equation for this relationship between y , x , z , u , and w .
10. (5 pts) Explain why $x = y^2 - 5$ does *not* define y as a function of x .



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 $h(x) = 3x^2 + 5x - 5$ in the form $a(x-h)^2 + k$. What is the vertex?

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

B4: What is the domain of $w(x) = \frac{x^{77} - 5x^{12} + 17x}{\sqrt{-7x+14}}$

B5: Prove that $g(x) = -3\sqrt{-7x+14} + 5$ is 1-to-1.

B6: Given $g(x) = -3\sqrt{-7x+14} + 5$, find what $g^{-1}(x)$ is.

B7: Given $g(x) = -3\sqrt{-7x + 14} + 5$, find the domain and range of $g^{-1}(x)$.