

Do your work and circle (or square-box) final answers on the separate paper, provided.

Only write on one side of each sheet. No points for what's on the back (either for or against!).

All that you should put on this cover sheet is your name.

1. (5 kindness points) I can really see how you made an effort to be clear, use ONLY one column per page, ONLY one side of writing per page, and plenty of room for my silly comments. Thanks for writing big enough to read, and really dark, which helped me see your work so easily. You helped me serve your classmates, better, too, because your paper was quick and easy to grade. I thank you on their behalf.
2. Consider the relation $R = \{(-2, 3), (1, 5), (2, 3), (3, -2)\}$.
 - a. (5 pts) Is R a function? If not, why not?
 - b. (5 pts) What is the domain of R ?
 - c. (5 pts) What is the range of R ?
 - d. (5 pts) What stops R from being 1-to-1, if anything?
3. Let $f(x) = \sqrt{x-9}$ and $g(x) = \frac{x+3}{x-5}$.
 - a. (5 pts) What is the domain of f ?
 - b. (5 pts) What is the domain of g ?
 - c. (5 pts) Write the function $\frac{f}{g}$. Do not simplify.
 - d. (5 pts) What is the domain of $\frac{f}{g}$?
 - e. (5 pts) Write the function $f \circ g$. Do not simplify.
 - f. (5 pts) What is the domain of $f \circ g$? (Highest level of synthesis.)
4. (5 pts) Let $f(x) = 5\sqrt{x-7}$. Provide a simple graph f by finding its intercepts. You don't need to go step-by-step like you did in your Writing Project. Then write the difference quotient for f and illustrate what it represents, with a secant line from a point $(x, f(x))$ to another point $(x+h, f(x+h))$ on your graph.

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5. (5 pts) Simplify the difference quotient for $f(x) = 3x^2 - 5x$.
6. Let $g(x) = \frac{-5}{(2x+4)^3} + 7$. THIS is your Writing-Project-#2-type question.
- (20 pts) Sketch the graph of $g(x)$, by transforming the basic function $f(x) = \frac{1}{x^3}$. I want to see two (2) points labeled in the graph of f , namely $(-1, -1)$ and $(1, 1)$, and track where those points are moved to after every step, as demonstrated in video, until you've transformed f into g . This will take 5 graphs, counting the first graph of $f(x) = \frac{1}{x^3}$ as the first. (I number them 0 thru 4, for no good reason.)
 - (5 pts) State the domain and range of $g(x)$, based on your final graph. Use interval notation in your answer.
 - (5 pts) Find the x - or y -intercept(s) of $g(x)$, and label them, clearly, on the graph with ordered-pair labels (OPLs). For full credit, I expect a fraction, possibly improper, in lowest terms, for one, and simplified radical form for the other.
7. (5 pts) Prove that $f(x) = 6x + 5$ is one-to-one. I expect an algebraic argument, not just a picture.
8. (5 pts) Suppose that y is jointly proportional to the square of x and the cube of z . Write an equation for this relationship between x , y , and z .

Bonus Section (5 pts each) Are you smarter than the average bear? Find out, by answering up to 3 of the following for up to 15 points.



- B1.** Simplify the difference quotient for the function $f(x) = \frac{1}{\sqrt{x}}$. Then pass to the limit, as h approaches zero, and demonstrate an early aptitude for Calculus, with a standard, first-week exercise.
- B2.** Complete the square to re-write the function $h(x) = 5x^2 - 2x + 7$ in the form $a(x - h)^2 + k$. What is the vertex?
- B3.** What is the domain of $\frac{x - 5}{5x^2 - 2x + 7}$
- B4.** What is the domain of $\frac{x^{77} - 5x^{12} + 17x}{5x^2 - 2x + 7}$
- B5.** Solve the absolute-value inequality $|5 - 2x| > 17$. Express the solution in interval notation.
- B6.** Sketch the graph of the piecewise-defined function $h(x) = \begin{cases} -3x + 4 & \text{if } x < 1 \\ x^2 + 5 & \text{if } x \geq 1 \end{cases}$.