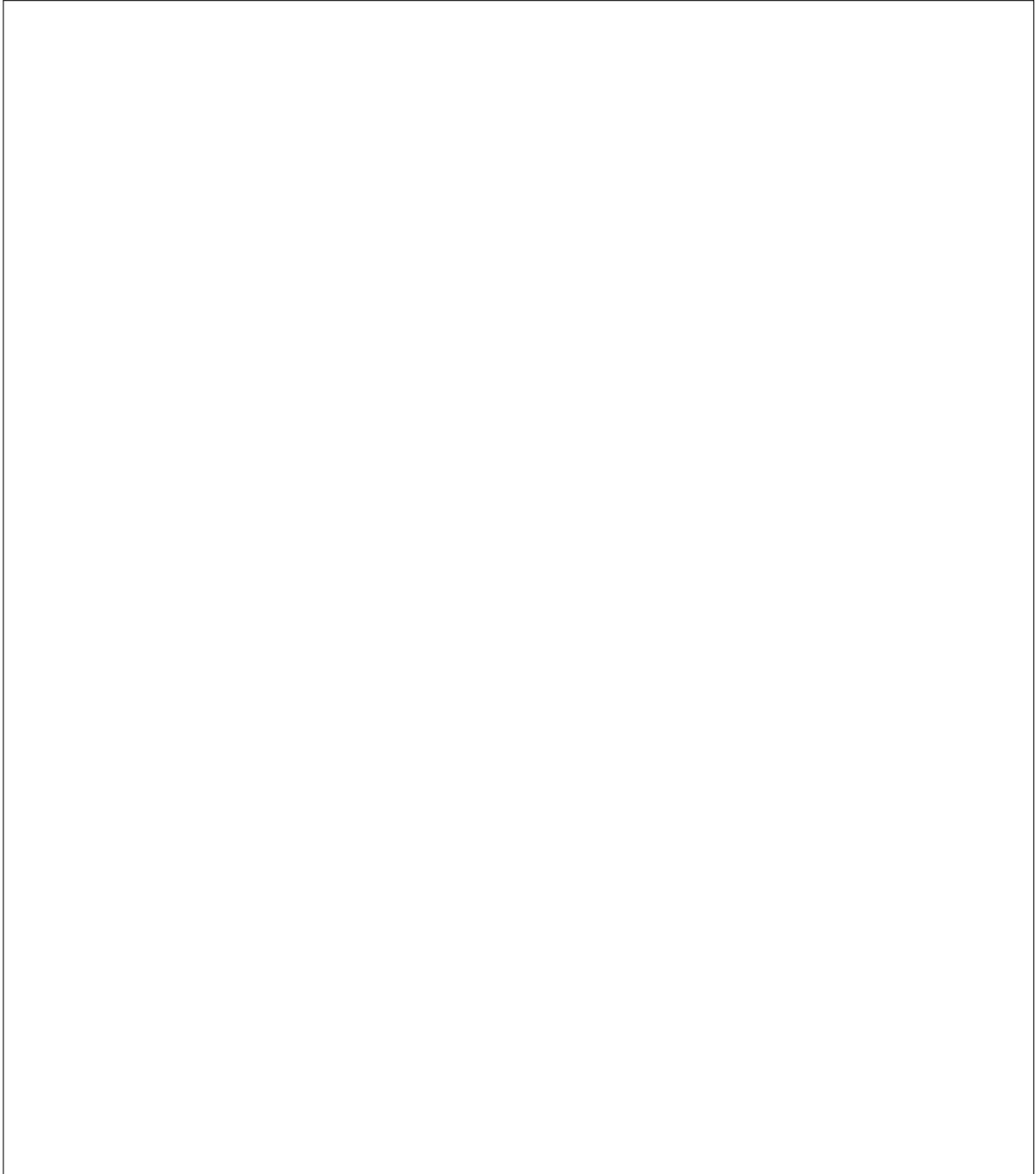


## Midterm 2 (Practice)

There are 11 problems worth 10 points each. A score of above 100 is possible on this midterm. Show all of your work for full credit.

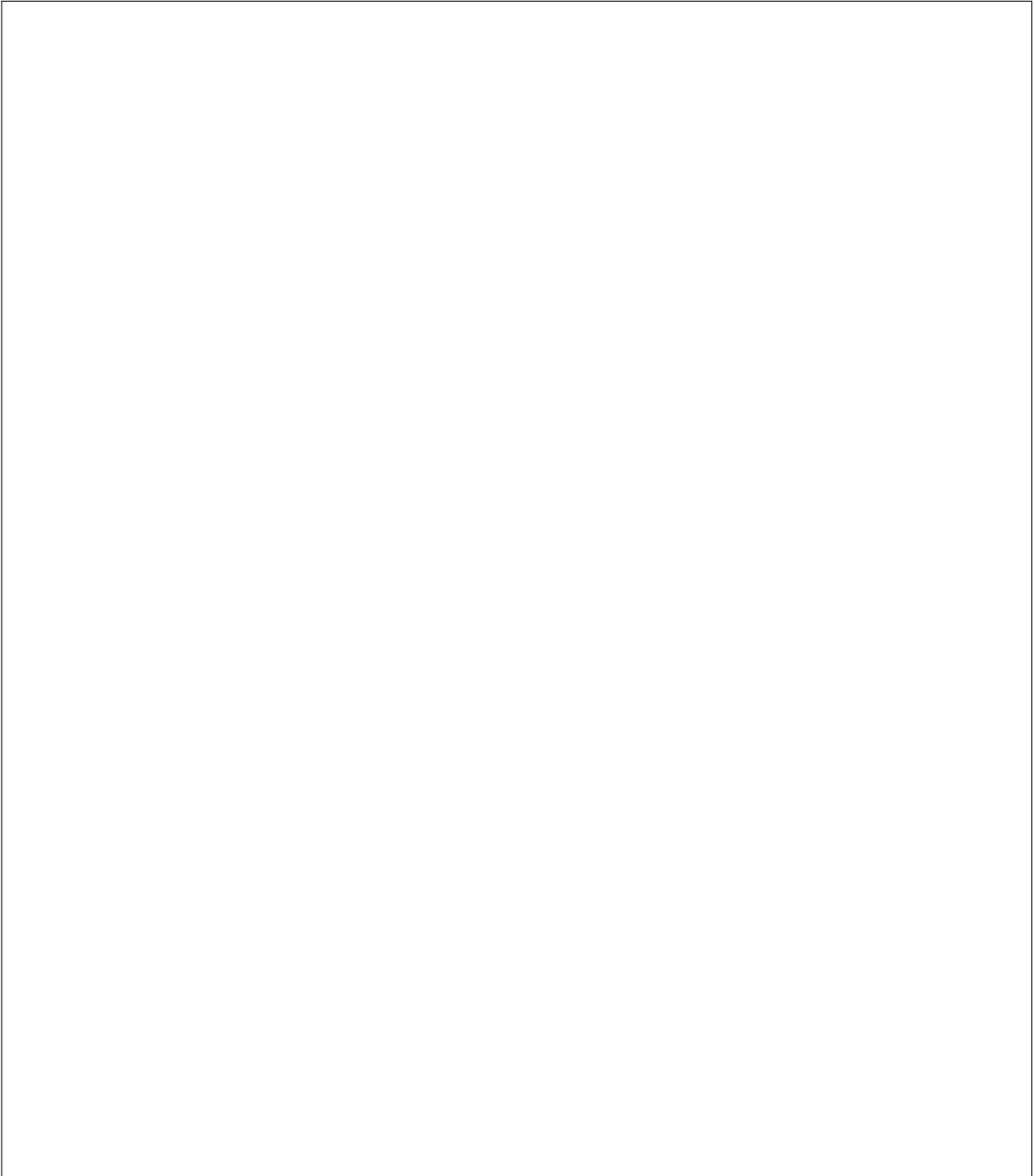
1. Solve the following logarithmic equation.

$$\log_2(x - 3) + \log_2(x + 1) = 5$$



2. Solve the following exponential equation.

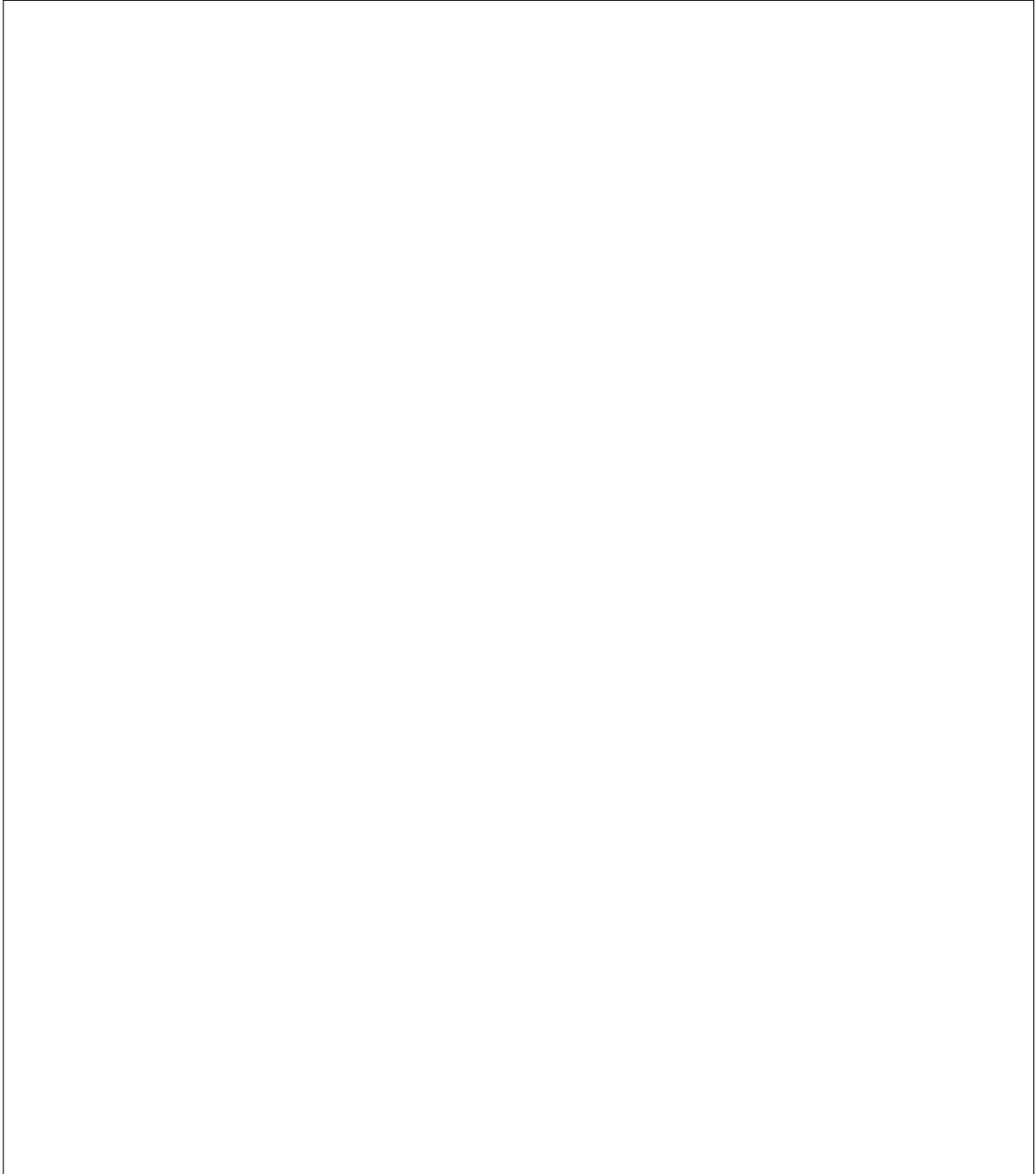
$$5^{x/3} = 3^{x+1}$$



3. Use the laws of logarithms to combine the expression into a single logarithm.

$$\log_3 x - 2\log_3(x + 1) + 3\log_3 y$$

4. Express the quadratic function  $f(x) = x^2 - x - 6$  in vertex form  $a(x - h)^2 + k$ , sketch its graph, and state the domain and range.



5. Let  $P(x) = 2x^3 - 5x^2 - 4x + 3$

- a) List all possible rational zeros of  $P$ .
- b) Find the complete factorization of  $P$ .
- c) Find the zeros of  $P$ .
- d) Sketch the graph of  $P$ .

(This is probably a bit too long to be a single 10 point question on the midterm, but since this is just practice I'll leave it as is).



6. Consider the following rational functions

$$r(x) = \frac{2x - 1}{x^2 - x - 2}, \quad s(x) = \frac{x^3}{x^2 + 4}, \quad t(x) = \frac{x^3 - 9x}{x + 2}$$

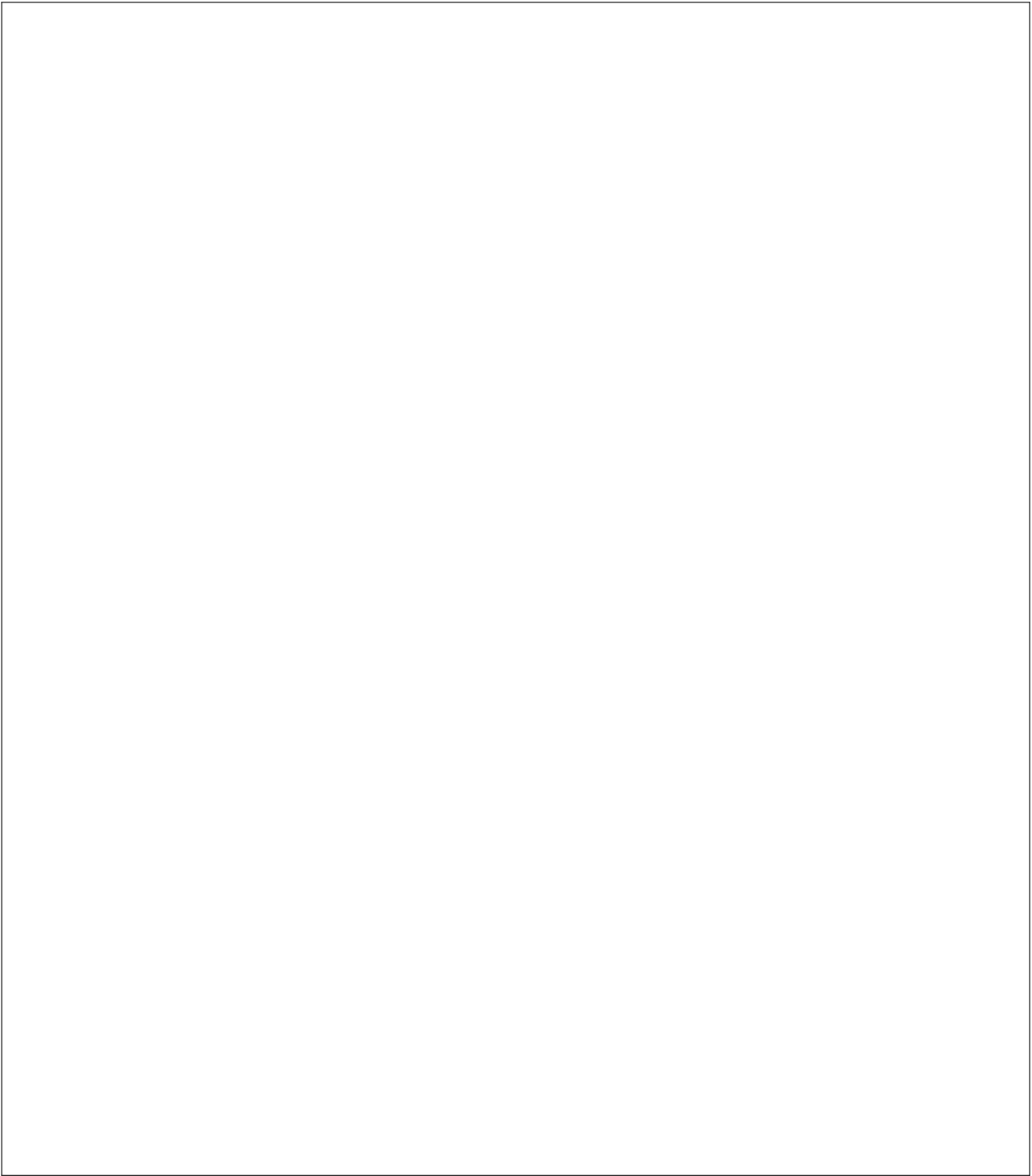
$$u(x) = \frac{x^2 + x - 6}{x^2 - 25}, \quad w(x) = \frac{x^3 + 6x^2 + 9x}{x + 3}$$

You do not need to justify your answers for full credit, but if you want partial credit you should.

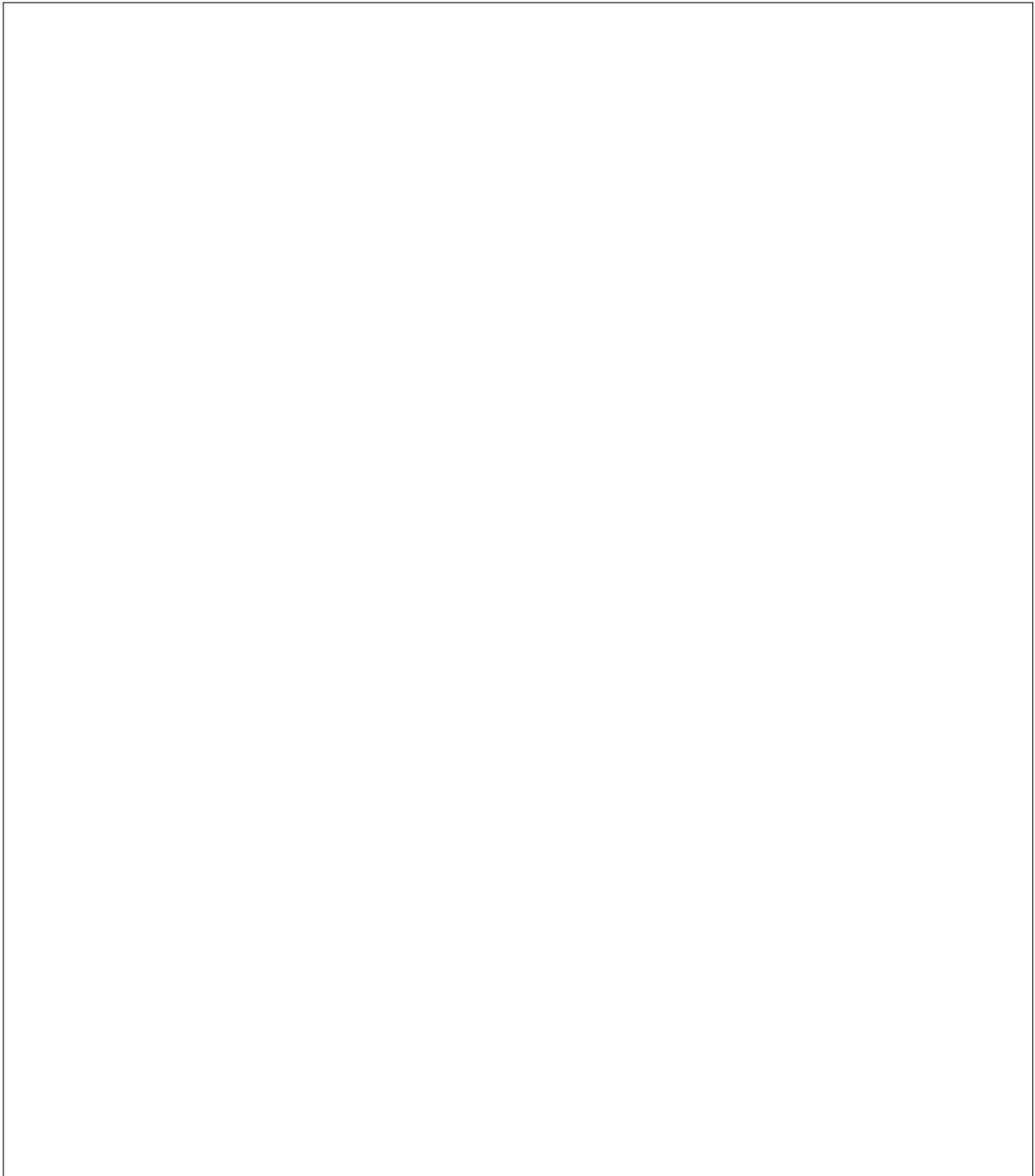
- a) Which of these rational functions has a horizontal asymptote?
- b) Which of these functions has a slant asymptote?
- c) Which of these functions has **no** vertical asymptote?
- d) Which of these functions has a “hole” (removable discontinuity)?

7. Solve the inequality.

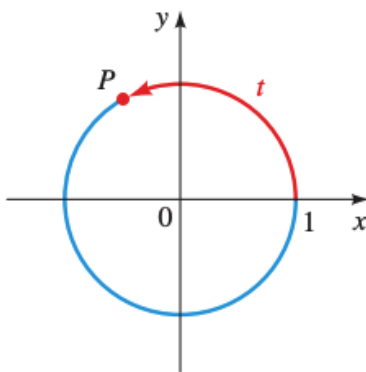
$$x \leq \frac{6-x}{2x-5}$$



8. The point  $P(x, y)$  is on the unit circle in Quadrant IV. If  $x = \frac{\sqrt{11}}{5}$ . (Hint you should know: Quadrant IV has positive  $x$  and negative  $y$ ).



9. The point  $P$  in the figure has the  $y$  coordinate  $\frac{4}{5}$ . Find  $\tan t$  and  $\sec t$ .



10. Find the exact value of the following expressions

$$\sin\left(\frac{7\pi}{6}\right) \quad \cos\left(\frac{13\pi}{4}\right) \quad \tan\left(-\frac{5\pi}{3}\right) \quad \csc\left(\frac{3\pi}{2}\right)$$

11. Sketch (at least) one period of the following function. Label at least three points with rational coordinates on the same period.

$$2 \sin \left( \frac{1}{2}x - \frac{\pi}{6} \right)$$

