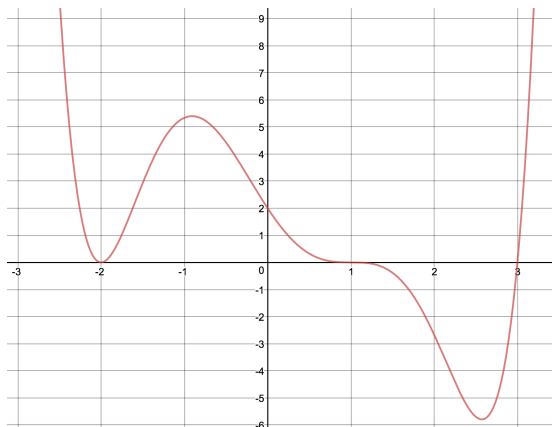


## Math 110 Review for Exam 2

1. Use the graph of the **sixth** degree polynomial  $p(x)$  below to answer the following.



- List each zero of  $f$  in point form, and state its likely multiplicity (keep in mind this is a 6th degree polynomial).
  - State the  $y$ -intercept in point form.
  - Write a possible formula for  $p(x)$ . You can leave this in factored form. Remember to use your  $y$ -intercept to find  $a$ , the leading coefficient.
2. Given the polynomials below, answer the following:
- $$P(x) = 2x^3 + 3x^2 - 3x - 2 \quad P(x) = x^4 + 2x^3 - 7x^2 - 8x + 12$$
- State all possible rational zeros.
  - For each, use synthetic division to show  $x = 1$  is a zero of the function.
  - Write the function as  $P(x) = (x - 1)Q(x)$  and finish factoring the function into linear factors.
  - Graph each function.
  - State the intervals on which  $P(x) \leq 0$
3. Factor the following polynomials into linear factors (real and complex) and find all zeros (real and complex).
- $$P(x) = x^4 + 8x^2 - 9 \quad p(x) = x^4 - 64$$
4. Find a formula for a third degree polynomial that has zeros 2 and  $3i$ , and has a  $y$ -intercept of -9.

Notice problems #5-7 are from HW 7.

5. Consider the function  $g(x) = -2^{x-2} + 3$ , and answer the following.
- Refer to the function  $f(x) = 2^x$ , and state what transformations of  $f$  is the function  $g(x) = -2^{x-2} + 3$ .
  - Graph  $f$  and  $g$  below.
  - State the Domain, Range, and Asymptote of  $g$ .
  - Find the average rate of change of  $g$  on the interval  $[1, 3]$ .
6. The function below represents a population of fish in a pond  $t$  years after a group of fish were initially placed in the pond (the pond did not have any fish before this group was introduced). Answer the following.
- $$P(t) = \frac{1200}{1 + 11e^{-0.2t}}$$
- How many fish were in group initially placed in the pond,  $t = 0$ ?
  - What value does the population approach as  $t \rightarrow \infty$ ?
7. Given  $P(x) = x^4 - x^3 - 11x^2 + 9x + 18$ , answer the following.
- List all possible rational zeros of  $P$ .
  - Using synthetic division, show  $x = -1$  is a zero of  $P$ .

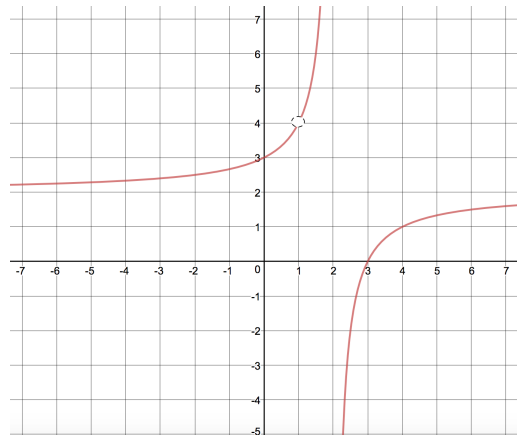
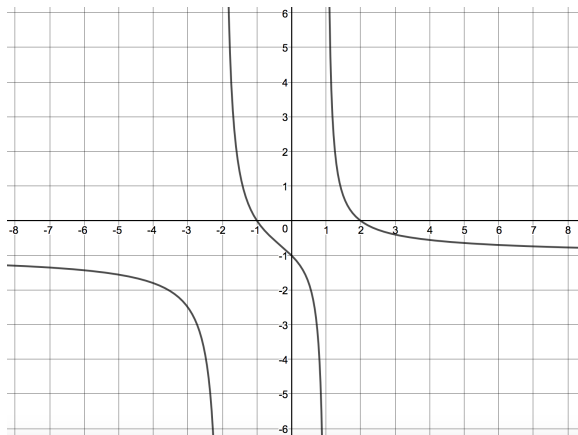
- c. Using your work from part b, fully factor  $P$  into real linear factors.  
 d. Sketch a graph of  $P$  below.  
 e. Find the intervals for which  $x^4 - x^3 - 11x^2 + 9x + 18 \leq 0$

8. For the following rational functions, answer the following.

$$R(x) = \frac{2}{x^2 + 2x - 3} \quad R(x) = \frac{2x^2 - 8}{x^2 - 4x} \quad R(x) = \frac{x^2 + 3x}{x - 2} \quad R(x) = \frac{x^2 - x - 6}{x^2 - 9}$$

- a. Find the zeros of the function.  
 b. Find the  $y$ -intercept.  
 c. Find all asymptotes (Vertical, Horizontal, oblique (slant), if any).  
 d. Sketch a graph of the function.  
 e. State the intervals in which  $R(x) \geq 0$ .
9. Given the following graphs of rational functions, answer the following.

- a. Find the zeros of the function.  
 b. Find the  $y$ -intercept.  
 c. Find all asymptotes (Vertical, Horizontal, oblique (slant), if any).  
 d. What is the domain and range of  $R(x)$ ?  
 e. Use your answers above to find a possible formula for  $R(x)$ .



10. Graph the following exponential functions state the domain, range, and asymptote.

$$F(x) = 2^x - 3 \quad g(x) = 4 + \left(\frac{1}{2}\right)^x \quad f(x) = 2^{x-4} + 1 \quad h(x) = 6 - 3^x$$

11. Graph  $f(x) = e^x$ , and then use this to sketch a graph of the following.

$$g(x) = e^{-x} - 3 \quad h(x) = 1 - e^{x+1}$$

12. A sky diver jumps from a reasonable height above ground. The downward velocity of the sky diver at time  $t$  is given by  $v(t) = 180(1 - e^{-0.2t})$ , where  $t$  is measured in seconds and  $v(t)$  is measured in feet per second,  $\frac{ft}{sec}$ .
- a. Find the initial velocity of the sky diver.  
 b. Find the velocity after 10 seconds. Leave your answer exact.  
 c. The maximum velocity of a falling object with wind resistance is called its terminal velocity. Find the terminal velocity of the sky diver. To do so, find what the velocity approaches as  $t \rightarrow \infty$ .
13. If \$10,000 is invested at an interest rate of 5% per year, find the amount of the investment after 10 years for the following compounding methods. Leave your answer exact.
- a. Annually  
 b. Monthly  
 c. Continuously