

NAME:

1. [5] TRUE/FALSE: Circle T in each of the following cases if the statement is *always* true. Otherwise, circle F.

T F  $\pi x^3 - (\sqrt{5})x + 3$  is a polynomial.

T F  $\frac{1}{x} + \frac{2}{x+1} = \frac{4}{x+1}$

T F  $\frac{-2^{-2}}{6^{-1}} = \frac{3}{2}$

T F  $\log(u+v) = \log(u) + \log(v)$

T F  $\log_6 36 = 2$

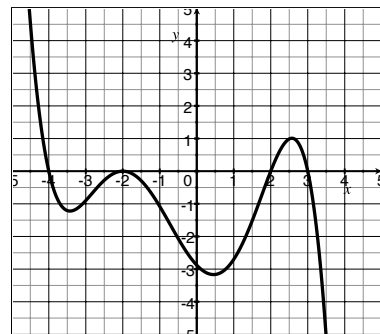
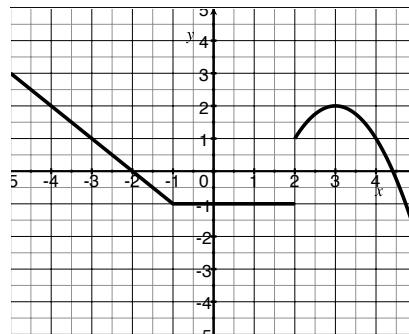
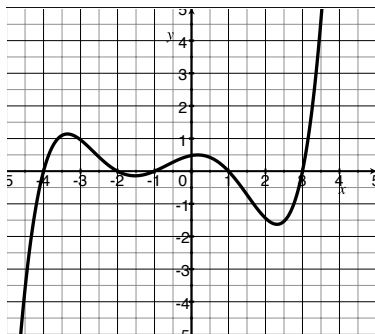
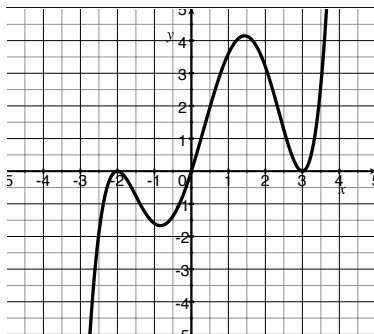
Show your work for the following problems. The correct answer with no supporting work will receive NO credit.

2. [5] (PracticeExam #6) The function below “passes the horizontal line test” so it has an inverse, find the formula for the inverse.

$$y = \log_3 \left( \frac{2x}{x-5} \right)$$

3. [4] (Exponent Wks #2) Simplify:  $\frac{(2zx^3)^2}{10x^{-1}\sqrt{z}}$

4. [3] (WebHW6 #12) Let  $h$  be a 5<sup>th</sup> degree polynomial that has  $(x + 2)^2$  as a factor (but  $(x + 2)^3$  is not a factor). Which of the following could be the graph of  $h$ ? (Circle all that are possible.)



5. [4] (WebHW6 #16) Let  $f(x) = x^3 - x^2 - 7x + 3$ . Use the fact that the polynomial  $x^2 + 2x - 1$  is a factor of  $f(x)$  to find all the real roots of  $f(x)$ .  
Remember what a factor is!! For example, 4 is a factor of 12 because  $12 = 4 * 3$ !!  
Note: using your calculator to find the roots is *not enough* to earn full marks here!!

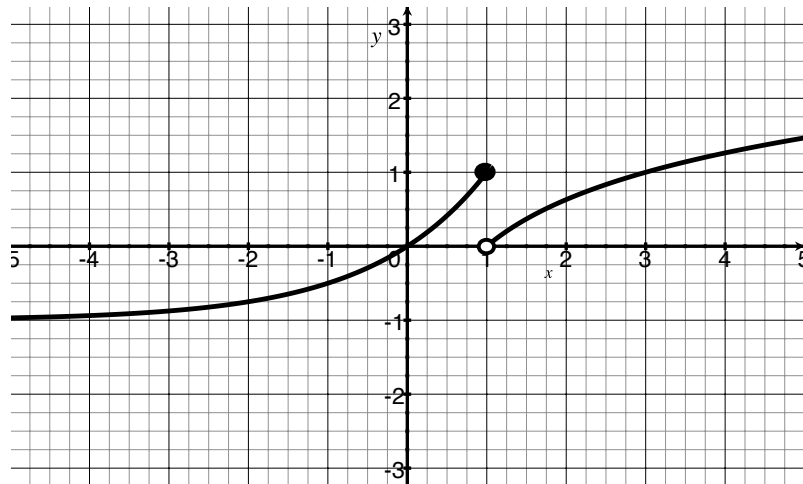
6. Find all  $x$  that satisfy the following:

(a) [3] (§3.4 #29)  $3 \cdot 4^{2x-1} + 4 = 14$

(b) [3] (10/29 lecture)  $\log(x + 1) + \log(x - 1) = 0$

7. Let  $f$  be the function whose graph is given to the right.

The function  $f$  is of the form  $a^x + c$  when  $x \leq 1$  and  $\log_b(x)$  when  $1 < x$ .



(a) [2] (WebHW7 #22) Sketch the graph of  $f(x - 2)$ .

(b) [5] (§3.2 #62 & §3.1 #54) Find a formula for  $f$  in the indicated form. Recall! The function  $f$  is of the form  $a^x + c$  when  $x \leq 1$  and  $\log_b(x)$  when  $1 < x$ .

$$f(x) = \begin{cases} a^x + c & x \leq 1 \\ \log_b(x) & 1 < x \end{cases}$$

8. [3] Create a word problem that makes use of either an exponential or logarithmic function.
9. [3] (§3.3 #13) Given that  $\log x = 2$ ,  $\log y = 3$ , and  $\log 2 \approx 0.3$ , evaluate:  $\log(2x^2y)$ .
10. [4] (§3.1 #92) Fidelity Federal offers three type of investments: (i) 9.7% compounded annually, (ii) 9.6% compounded monthly, and (iii) 9.5% compounded continuously. Which investments is the best deal?

11. [6] Choose *ONE* of the following. Clearly identify which of the two you are answering and what work you want considered for credit.
- (a) (§3.2 #106) In a lake,  $\frac{1}{4}$  of the water is replaced by clean water every year. Sixteen thousand cubic meters of soluble toxic chemical spill takes place in the lake.
- How much toxin will be left after 12 years?
  - When will 80% of the toxin be eliminated?
- (b) (Word Problem Wks #10) Recall from class that pH is measured on a logarithmic scale and that the pH level of a substance can be computed by  $\text{pH} = -\log[\text{H}^+]$ , where  $[\text{H}^+]$  is the concentration of hydrogen ions measured in moles per liter (M). Assume that the white vinegar in this problem has a pH level of 2.5 and your stomach acid has a pH level of 1.6.
- How many times stronger is stomach acid than the white vinegar?
  - If you found a substance X whose pH level is 1.5 more than the pH value of vinegar. How are the concentration of hydrogen ions in X and vinegar related?