

NAME:

1. [6] TRUE/FALSE: Circle T in each of the following cases if the statement is *always* true. Otherwise, circle F. Let x and y be positive real numbers.

T F $\frac{2}{b^2} + \frac{1}{b} = \frac{5}{b^2}$

T F $(x^3)^3 = x^6$.

T F The range of $y = e^x - 2$ is $(-1, \infty)$.

T F $y = (x - 2)^3 x(x + 50)$ has 3 roots.

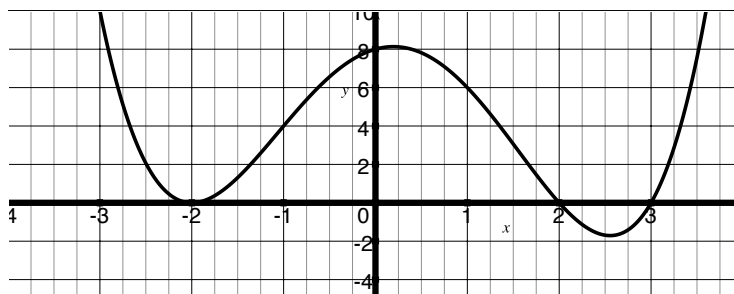
T F $x^{-2} = x^{\frac{1}{2}}$

T F $\log(x - y) = \log(x) - \log(y)$

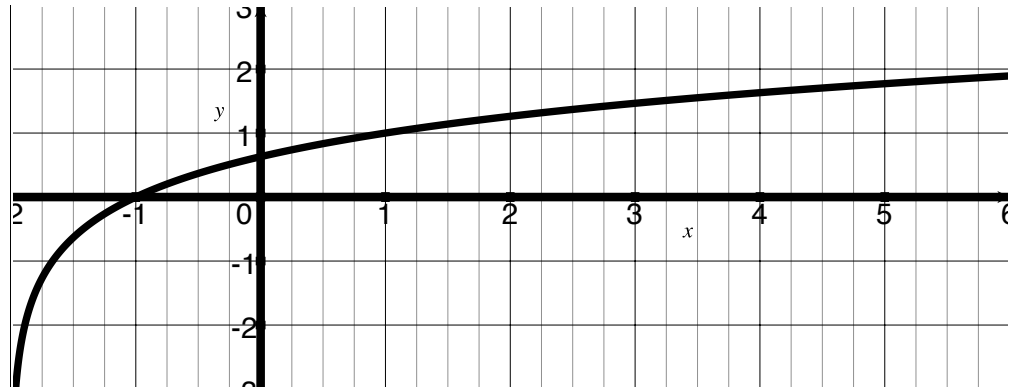
Show your work for the following problems. The correct answer with no supporting work will receive NO credit.

2. [3] (WebHW7 #22) How long does it take for a deposit of \$1400 to double at 3% compounded continuously?

3. [4] (Quiz3 #2) Given the graph below is of a polynomial of degree four, find the algebraic rule/write an equation for the graph.



4. [3] (§3.2 #56) The graph is of an exponential function $\log_b(x)$ that has been horizontally shifted. Find the algebraic rule/write an equation for the graph.



5. For each equation below, find x .

(a) [3] (exponentActivity #3) $(x + 1)^{-1} + 3 = x$

(b) [3] (WebHW8 #21) $6^{1-x} = 5^{5x+6}$

(c) [4] (§3.4 #76) $\log_4 \sqrt{x+3} - \log_4 \sqrt{2x-1} = \frac{1}{4}$

6. [3] (PracticeExam#6) The function $f(x) = 3 \cdot 2^x + 5$ passes the horizontal line test so has an inverse. Find $f^{-1}(x)$.

7. [2] (Quiz3 #3) Write the following logarithmic statement in exponential form:

$$2 \log_b(a) = x$$

8. [3] Write a polynomial p that satisfied the following criteria:

- as x goes to ∞ , then y goes to $-\infty$
- the only roots are: -1,2 and 4

Note: there is more than one right answer!!!

9. [4] (WebHW6 #16) Find the remainder when $x^4 - 398x^2 + 1$ is divided by $x^2 - 20x + 1$

10. [3] (logProperties #3) Let $\log_2(x) = 7$ and $\log_2(y) = 6$. Find $\log_2(8xy)$

11. [4] Choose *ONE* of the following. Clearly identify which of the two you are answering and what work you want to be considered for credit.

No, doing both questions will not earn you extra credit.

(a) (WebHW9 #10) *pH Scales*: Let $[H^+]$ be the concentration of hydrogen ions in solution X measured in moles per liter (denoted M). Then

$$\text{pH level of solution } X = -\log[H^+]$$

Suppose that hydrogen ion concentration in a solution A is 10,000 times that in solution B . Find a function relating the pH level of solution A to the pH level of solution B .

(b) (§3.2 #115) *Benford's Law*: The probability that the first decimal-digit of a raw data sample (from 1 to 9) is given by $P_m = \log(m + 1) - \log(m)$.

What percentage of data would financial investigators expect the numbers in accounting books to have 3 as a first digit?

12. [5] Choose *ONE* of the following. Clearly identify which of the two you are answering and what work you want to be considered for credit.

No, doing both questions will not earn you extra credit.

- (a) (expActivity #5) *Newton's Law of Cooling*: If D is the initial temperature difference between an object and its surroundings, and if its surroundings have a temperature T , then the temperature of the object A and time t is modeled by:

$$A = T + De^{-kt}$$

where k is a positive constant that depends on the type of object.

Initially coffee has a temperature of 200°F in a room that is 70° . After ten minutes the temperature is 150° . What will the temperature of the coffee be after an additional ten minutes passes?

- (b) (§3.3 #108) *Amortization formula*: If r is the annual interest rate, M is the mortgage amount, t is the number of years, and n is the number of payments a year, then the payment P on a mortgage is given by:

$$P = \frac{r \cdot M}{1 - \left(1 + \frac{r}{n}\right)^{-nt}} \div n$$

The Garcia family wanted to take out a mortgage for \$150,000 with 8% with monthly payments. The family can afford monthly payments of \$1200. How long would they have to make payments to pay off their mortgage and how much interest would they be paying?