

**Important Notes**

- Answers to the problems below should be written clearly on a clean sheet of paper. Answers should be presented in order.
- Be sure to scan in your work as a easy to read PDF. All the work should be in the same file.

**For each question below, clearly show all work. Then write one or two sentences explaining the general method or steps you took.**

Sample Question: Solve for  $x$ :

$$\frac{1}{4^{3x-12}} = 8^{x^2}$$

Sample Solution:

$$\begin{aligned} \frac{1}{4^{3x-12}} &= 8^{x^2} \\ 4^{-(3x-12)} &= 8^{x^2} \\ (2^2)^{-(3x-12)} &= (2^3)^{x^2} \\ 2^{-2(3x-12)} &= 2^{3x^2} \\ -2(3x - 12) &= 3x^2 \\ -6x + 24 &= 3x^2 \\ 3x^2 + 6x - 24 &= 0 \\ 3(x^2 + 2x - 8) &= 0 \\ 3(x + 4)(x - 2) &= 0 \\ x &= -4, 2 \end{aligned}$$

In this problem, I noticed that both 4 and 8 are powers of 2, so I used exponent rules to make them have the same base. Once they had the same base, I just had to set the exponents equal to each other and then solve that quadratic equation by factoring.

1. Honor Statement: **Chegg is cheating!** Posting these problems on Chegg (or Bartleby), viewing solutions to them on Chegg(or Bartleby), searching other sites for answers or copying or viewing someone else's work all are examples of academic integrity violations, even if you don't copy the solution. The final work should be yours and reflect your individual understanding of the problem. You may not use Chegg, Bartleby or other sites that allow you to post these problems or view solutions to problems others have posted to assist with this assignment. **Academic Integrity violations related to this document will result in the grade of a 0 on both this and the corresponding exam.** You may ask questions during class or office hours. Please write that you have read, understand and will follow this honor statement.

2. Simplify the following expression so there are **only positive and negative exponents** and **not radicals or division**.  $\left(\frac{x^3y^5}{\sqrt{z}}\right)^4$

3. Rewrite the rational expression as a single rational expression, simplified as much as possible.

$$\frac{16x^2 - 4}{8(2x - 1)} - \frac{1}{4x - 2}$$

4. In each case, find the equation of the line.

1. through  $(1, 4)$  and parallel to  $2x + 4y = 7$
2.  $x$ -intercept of 5 and  $y$ -intercept of 8

5. What is the domain of  $f(x) = \frac{\ln(x-2)\sqrt{9-x}}{x^2-6x-7}$ ? Give your answer using interval notation.

6. Let  $f(x) = x^3 + 1$  and  $g(x) = \sqrt[3]{x}$ . Find and simplify each of the following expressions and give their domain.

(a)  $(g \circ f)(x)$

(b)  $(f \circ g)(x)$

(c)  $\frac{f(x)}{g(x)}$

(d)  $f(x+h)$

7. Let  $f(x) = \sqrt{x^2 + 1}$ . Write  $f(x)$  as the composition of two simpler functions, i.e. find  $g(x)$  and  $h(x)$  such that  $f(x) = (g \circ h)(x)$ . Be sure to indicate which function is  $g$  and which is  $h$ .

8. Your college newspaper, The UConn Daily, has fixed production costs of \$80 per edition and distribution costs of \$0.35 per copy. The UConn Daily sells for \$0.75 per copy.

(a) Write down the associated linear profit function  $P(x)$  (in dollars) where  $x$  represents the number of copies of the newspaper made and sold.

(b) How many copies should be sold in order to break even?

(c) Your college yearbook is affected by supply and demand. If the demand equation is  $p = -\frac{1}{24}x + 2.25$ , where  $p$  is the price per copy in dollars and  $x$  is copies sold, what is the revenue?

9. Suppose you open an account with a principal investment of \$1000 and an annual interest rate of 2%.
- (a) Find an equation that determines how much money you have after  $t$  years if your interest is compounded once a year.
  - (b) How much money will you have in 50 years (round to the nearest cent) if your interest is compounded once a year?
  - (c) Find an equation that determines how much money you have after  $t$  years if your interest is compounded continuously.
  - (d) How much money will you have in 50 years (round to the nearest cent) if your interest is compounded continuously?
  - (e) What interest rate do you need for your money to triple in 15 years if your interest is compounded continuously?
10. The city tax rate for Taxlandia is 2% on the first \$100,000 of income and 4% on all income after \$100,000. Write a formula for  $T(x)$ , the amount of tax owed, as a piecewise function of  $x$ , income in dollars.
11. Solve for  $x$ :

$$\ln(x + 6) + \ln(x + 1) = \ln(3) + 2\ln(2\sqrt{x})$$