

Math 71X Review Problems

- Evaluate using a calculator.
- (a) $-2.831^{3.206}$ / (b) $10^{16.342}$ (c) $2.9 \cdot e^{2.830}$
- Give the domain and graph $f(x) = 1.5^x$ and its inverse.
- What is the formula for the inverse of the function given in Problem 3?
- Give the domain and graph $g(x) = 0.5^x$ and its inverse.
- What is the formula for the inverse of the function given in Problem 5?
- Solve the following application problems using the model for exponential growth, $A = A_0e^{kt}$. A population has an initial size of 3,241 with a 2.5% (0.025) annual instantaneous growth ratio.
 - Estimate the population size in 12 years.
 - When will the population reach 5000?
- Solve the following application problems using the model for exponential decay, $A = A_0e^{-kt}$. The pain reliever *ibuprofen* has an hourly instantaneous decay ratio of approximately 0.35% (0.35).
 - If a person takes an 800 mg tablet of ibuprofen, how much remains in her system after 3 hours?
 - When will 100 mg remain in her system?
- Give the inverse of the function $f(x) = 2x - 7$, and show that $f^{-1}(f(x)) = x$.
- Evaluate without a calculator:
 - $\log_4(16)$
 - $\log_7\left(\frac{1}{49}\right)$
 - $\log_d\left(\sqrt[3]{d}\right)$
 - $\log(1,000)$
 - $\ln(e^4)$
- Solve: $-3 \cdot 10^{-3x} + 12 = -51$.
- Solve: $11 - 2\log_4(8x - 8) = 5$.
- Suppose a solution has an H^+ cation concentration of 0.0194 moles per liter. What is the approximate *pH* of the solution?
- Fit an exponential function, $A = A_0e^{kt}$, to the data points $\{(-2, 0.6), (0, 1), (2, 16)\}$.
- Use the arithmetic series formula to evaluate the series: $\sum_{n=2}^{23} (4n - 5)$.
- Use the geometric series formula to evaluate the series: $\sum_{n=0}^8 5 \cdot 3^n$.
- How many newtons of force are there in 24.67 lb?

21. Suppose that a given medication is given to patients at the rate of 2.5 oz per pound of patient weight. Give the equivalent rate in milligrams of medication per kilogram of weight.
22. How many gallons are there in 4.23 L?
23. A doctor orders that a patient receives a medication known as dobutamine intravenously at 50 mg per 600 mL of solution at 2.5 mg per minute. At what rate of flow (in mL per hour) should this medication be administered?
24. Evaluate and round appropriately, assuming the 18 in the radical is exact:

$$\frac{0.0641 - 0.0512}{\frac{0.00147}{\sqrt{18}}}$$

26. Combine like terms: $\frac{4a^2b}{9} - \frac{2}{3}a^2b$.

27. Evaluate and express in scientific notation, rounded appropriately: $\sqrt{\frac{21.43 \times 10^{-11}}{3.193 \times 10^{-25}}}$.

28. Simplify: $\frac{15x^{-2}y^4}{20x^{-7}y^8}$.

29. The energy stored in a capacitor is given by

$$E = \frac{1}{2}CV^2.$$

Solve this equation for the voltage V .

30. The capacitance of a cylindrical capacitor is given by

$$C = 2\pi\kappa\epsilon_0 \cdot \frac{L}{\ln\left(\frac{a}{b}\right)},$$

where κ and ϵ_0 are constants. Solve this equation for the outer radius of the conductor, b .

31. The speed of sound in a gas vapor is computed using the formula

$$v = \sqrt{\frac{\gamma RT}{M}}.$$

Solve this equation for the molecular weight, M .

32. Air pressure is inversely proportional to volume. Suppose that a given quantity of air is compressed to 3.5 mL, under a pressure of 19 atm. What pressure would be experienced by this air if it is expanded to a volume of 8 mL?

33. Solve the inequality: $3|x - 2| < 15$.

34. Solve the inequality: $5 - \frac{1}{2}(y + 1) \geq 2y + \frac{3}{4}$.

35. Give the slope-intercept equation of the line which contains the points (6, 15) and (-2, -1).

36. Graph the line $y = \frac{1}{4}x - 1$, labelling both intercepts.

37. Solve the equation using the quadratic formula: $v^2 + 1 = 2v + 7$.

38. Graph the quadratic $y = -2x^2 - 8x + 1$. Label the coordinates of the intercepts and vertex.

39. Solve the linear system by elimination:
$$\begin{cases} x - 3y + z = 12 \\ 2x + 2y + 5z = 3 \\ 3x - 3y + 2z = 17 \end{cases}$$

40. Solve by Cramer's Rule:
$$\begin{cases} -7x + 5y = -11 \\ 6x - 3y = 3 \end{cases}$$

41. Multiply: $\begin{bmatrix} 2 & 5 \\ -4 & 3 \end{bmatrix} \cdot \begin{bmatrix} 3 & 4 \\ 1 & -2 \end{bmatrix}$

42. Use least-squares methods to fit a regression line to the data points: $\{(-3, -5), (0, 1), (3, 2)\}$.

43. Expand $(x+5)^6$, $(y+6)^5$

44. Find 6C_2 , ${}^{10}C_7$, ${}^{14}C_{10}$, $\frac{7! \cdot 3!}{12!}$

45. Find

$$\begin{vmatrix} 1 & -2 & 3 \\ 2 & 1 & -1 \\ 0 & -3 & 5 \end{vmatrix}$$