

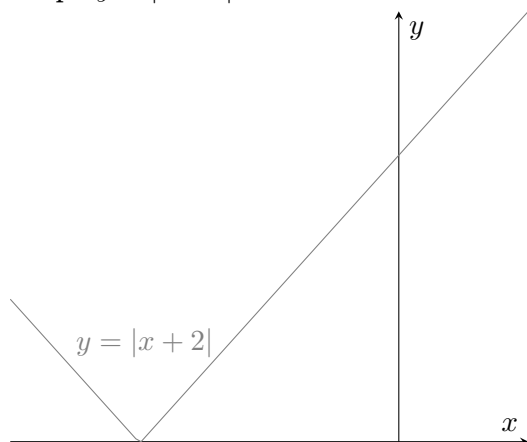
Problem Set 1 - PS 402 DUE Friday 9/30 6pm ANSWER KEY

1. Exponents and Logarithms

- (a) Multiply $x^4 y^3 z^2 (1 + x^2 y^2)$ $x^4 y^3 z^2 + x^6 y^5 z^2$
- (b) Simplify $((xy)^{-6})^{0.5} y^3 z^3 \frac{z^3}{x^3}$ or $(\frac{z}{x})^3$
- (c) Simplify $((xy)^2)^{1.5} x^{-3} y^{-3}$ 1
- (d) Solve for $\ln(e^5 / e^{2.5})$ 2.5
- (e) Simplify $e^{\ln 7.14}$ 7.14
- (f) What is $\log_{7134\pi}(1)$? 0 (log 1, with any base, is always zero)
- (g) Solve for x $\log_x(16) = 4$ 2
- (h) Combine into one term: $\log(3x) + 2\log(y)$ $\log(3x * y^2)$

2. Inequalities and Absolute Values

- (a) "Solve" for x: $x + y + 2 < 4$ $x < 2 - y$
- (b) "Solve" for x: $(-4)(x + 7) \geq -24$ $x \leq -1$
- (c) What is the absolute value of -24 ? 24
- (d) Graph $y = |x + 2|$



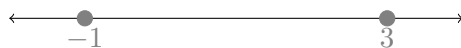
- (e) On number line, graph $|x + 2| \geq 3$ $x \geq 1, x \leq -5$



- (f) On number line, graph $|x - 7| < 1$ $6 < x < 8$



- (g) On number line, graph $|2x - 2| = 4$ $x = -1, 3$



3. Factor

- (a) $x^2 + 5x + 4$ $(x + 1)(x + 4)$
- (b) $6m^2 + 8m - 8$ $(3m - 2)(2m + 4)$ or $2(3m - 2)(m + 2)$
- (c) $5y^2 - 12yz + 7z^2$ $(5y - 7z)(y - z)$

4. Functions

- (a) What is the difference between a function and relation (in words)? A function cannot map two elements from the domain to the range.
- (b) Simplify $h(x) = g(f(x))$, where $f(x) = x^2 + 4$ and $g(x) = \sqrt{x - 4}$ $f(g(x)) = x$
- (c) Find the inverse function of $f(x) = 5x - 3$ The inverse is: $(3 + x)/5$
- (d) What is a quadratic function? (define and provide example) Highest degree of 2 – example $y = x^2 + x + a$
- (e) Why do we care if a function is monotonically doing anything? We are often specifying a relationship between variables and our outcome – we want to know, is more of x ALWAYS associated with more (or less) of y? Sometimes? Is there a peak? This language can help explain the relationship.

5. Exponent(ials)

- (a) Explain the difference between, and provide an example of, the following. Be sure to use an example different from the slides:
 - i. Exponent: A number multiplied by itself a set number of times (variable to a power, e.g. x^2)
 - ii. Exponential: A number multiplied by itself some unknown number of times (number to a variable, e.g. 3^x)
 - iii. Exponential Function: A particular number (e) to an unknown power (e.g. e^3x)

6. Identification

- (a) Identify the following greek letters by name. Include the meaning and common usage if you are able.
 - i. δ delta: derivatives
 - ii. β beta: coefficient
 - iii. α alpha: often a constant
 - iv. θ theta: often a variable
 - v. λ lambda: often for matrix (linear) algebra
 - vi. μ mu: means
 - vii. Δ Delta (uppercase): change
- (b) Identify the following mathematical symbols by name. Include the meaning/usage.
 - i. \in In (set theory)
 - ii. \cup Union (set theory)

iii. \subset Subset (set theory)

iv. \wedge And (logic)

7. Necessary and Sufficient Examples vary

(a) Provide an example of a necessary condition

(b) What is the difference between necessary and sufficient?