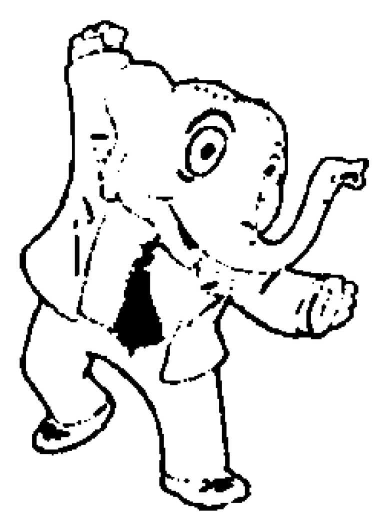
Review



Everyone has one week to become math 108 "fit". Several basic skills may have to be relearned. More importantly, this class has a "no calculator" policy. That means everything will be done by hand, starting with computation.

Ex 1: Compute the following:

a) -2^2+3^{-1}

$-4+\frac{1}{3}$

$-\frac{12}{3}+\frac{1}{3}=\boxed{-\frac{11}{3}}$

b) $10^{-4}=\frac{1}{10^4}$

$=\boxed{\frac{1}{10000}}$

c) $\dfrac{\frac{1}{4}-\frac{2}{5}}{-3-\frac{1}{3}} = \dfrac{\frac{5}{20}-\frac{8}{20}}{-\frac{9}{3}-\frac{1}{3}}$

$=\dfrac{-\frac{3}{20}}{-\frac{10}{3}} = -\frac{3}{20}\cdot-\frac{3}{10}$

$=\boxed{\frac{9}{200}}$

Sections $R.1$ – $R.3$:

The first review assignment covers ratios and exponents as well as polynomial operations. Here is one problem. The rest can be looked at outside of class.

Ex. 2: Simplify: $(x^2-2)(x^2+3)-(x-2)^2$

$x^4+3x^2-2x^2-6-x^2+4x-4$

$x^4+4x-10$

Recall the properties of exponents (from *R.*2):

1) $a^m \cdot a^n = a^{m+n}$

2) $\frac{a^m}{a^n}=a^{m-n}$

3) $(a^m)^n=a^{mn}$

4) $(ab)^m=a^m b^m$

5) $\left(\frac{a}{b}\right)^m=\frac{a^m}{b^m}$

6) $a^{-n}=\frac{1}{a^n}$ and $\frac{1}{a^{-n}}=a^n$

7) $\left(\frac{a}{b}\right)^{-n}=\left(\frac{b}{a}\right)^n$

Please make sure that you know these properties

Recall polynomial vocabulary: (from R.3)

The *degree* of a polynomial is the highest exponent on a variable.
The *leading coefficient* is the coefficient (number in front of) the highest power term.
The *constant* term is the term with no variable (letter)

Ex. 3. If $f(x) = 2x^2 - 4x^5 + 8x - 3$

a) What is the degree? 5

b) What is the leading coefficient? -4

c) What is the constant term? -3

Sections: $R.4 - R.5$:

R.4 covers factoring while R.5 deals with algebra fractions (rational expressions). These two topics are REALLY important.

Steps to factor:
1) Pull out the greatest common factor (if it has one other than 1)
2) If there are:
   - Two terms (binomial),
     try using the difference of two squares: $a^2 - b^2 = (a+b)(a-b)$ or
     try using the sum of two cubes: $a^3 + b^3 = (a+b)(a^2 - ab + b^2)$ or
     try using the difference of two cubes: $a^3 - b^3 = (a-b)(a^2 + ab + b^2)$
     Note: the sum of two squares does NOT factor
   - Three terms (trinomial), use trial and error or the "ac method"
   - Four terms, try factoring by grouping – group the first two terms and the last two terms, pull out the greatest common factor for each. Then pull out the greatest common factor from the new expression.
2) Check your factorization by it multiplying out to see if you get the original expression.

Ex. 4. Factor:

a) $9x^{10} - 18x^8$

$9x^8(x^2 - 2)$

$\boxed{9x^8(x - \sqrt{2})(x + \sqrt{2})}$

b) $\underbrace{x^3 + 3x^2}\ \underbrace{-4x - 12}$ by grouping

$x^2\underbrace{(x+3)} - 4\underbrace{(x+3)}$

$(x^2 - 4)(x+3)$

$\boxed{(x-2)(x+2)(x+3)}$

c) $2x^2+8x+6$

$2(x^2+4x+3)$

$\boxed{2(x+3)(x+1)}$

d) $2x^2-7x+3$

$\boxed{(2x-1)(x-3)}$

e) y^4-y^2-12

$(y^2)^2-y^2-12$

$(y^2-4)(y^2+3)$

$\boxed{(y-2)(y+2)(y^2+3)}$

f) $2x^3+16$

$2(x^3+8)=2(x^3+2^3)$

$\boxed{2(x+2)(x^2-2x+4)}$

Remember, a rational expression is the quotient of two polynomials: (from *R*.5)

Examples: $\frac{3}{5}$ $\qquad \frac{4}{x+1}$ $\qquad \frac{3x^2+4}{3x-4}$

*** Rules for canceling.

- Only factors can be cancelled
- Terms may NOT be cancelled.

Ex. 5: Express in simplest form:

$\frac{\cancel{x}(x+3)}{3\cancel{x}} = \boxed{\frac{x+3}{3}}$

$\frac{x(x-3)}{3-x} = \frac{x\cancel{(x-3)}}{-(x-3)} = \boxed{-x}$

$\frac{x+3}{x}$ ✓

$\frac{x-3x^2}{x^2} = \frac{\cancel{x}(1-3x)}{x^{\cancel{2}}} = \boxed{\frac{1-3x}{x}}$

$\frac{x^2-4}{x^2-5x+6} = \frac{\cancel{(x-2)}(x+2)}{(x-3)\cancel{(x-2)}} = \boxed{\frac{x+2}{x-3}}$

The **domain** of a rational expression includes all real numbers EXCEPT those values that make the denominator = 0.

Ex. 6: What is the domain of: $\dfrac{x+1}{2-x}$?

To **multiply or divide** rational expressions:

1) Factor all numerators and denominators.
2) Convert division into multiplication: $\dfrac{a}{b} \div \dfrac{c}{d} = \dfrac{a}{b} \cdot \dfrac{d}{c}$
3) Before multiplying, look to cancel factors.
4) Multiply. Factored form is preferred.

Multiplication does not require an LCD.

Ex. $\dfrac{x}{x-3} \cdot \dfrac{2x}{x+4} = \dfrac{2x^2}{(x-3)(x+4)}$

To **add or subtract** rational expressions:

1) Factor any denominators (not numerators)
2) Find the least common denominator (LCD)
3) Convert all expressions to have the same denominator
4) Add and/or subtract numerators and place over common denominator. Leave denominators in factored form.
5) Simplify as shown in earlier examples.

Ex. 7: Perform the indicated operations and simplify:

a) $\dfrac{2}{x^2-9} - \dfrac{5}{x+3}$

$(x-3)$

$\dfrac{2}{x^2-9} - \dfrac{5(x-3)}{x^2-9}$

pay attention to "–"

$\dfrac{2-5(x-3)}{x^2-9} = \dfrac{2-5x+15}{x^2-9}$

$= \boxed{\dfrac{-5x+17}{x^2-9}}$

b) $\dfrac{2(x+h)-(x+h)^2-(2x-x^2)}{h}$

pay attention

$\dfrac{\cancel{2x}+2h-\cancel{x^2}-2xh-h^2-\cancel{2x}+\cancel{x^2}}{h}$

$\dfrac{h(2-2x-h)}{\cancel{h}}$

$\boxed{2-2x-h}$

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Sections *R*.6 – *R*.7:

Properties of Radicals (*R*.6)

1) If n is even, $\sqrt[n]{a^n} = |a|$
2) If n is odd, $\sqrt[n]{a^n} = a$
3) $\sqrt[n]{a} \cdot \sqrt[n]{b} = \sqrt[n]{ab}$
4) $\dfrac{\sqrt[n]{a}}{\sqrt[n]{b}} = \sqrt[n]{\dfrac{a}{b}}$
5) $a^{\frac{m}{n}} = \sqrt[n]{a^m} = \left(\sqrt[n]{a}\right)^m$

Ex. 8: Evaluate:

a) 4^{-2}

b) $(2/3)^{-1}$

c) $9^{1/2}$

d) $8^{2/3}$

Note: radicals can only be added or subtracted if they have the same index and radicand (value underneath the radical)

For example, $\sqrt{2} + \sqrt{3}$ and $\sqrt{2} - 5$ CANNOT be simplified. However the following can be simplified: $5\sqrt{2} - 4\sqrt{2} = 1\sqrt{2} = \sqrt{2}$

Ex. 9: Simplify. Assume variables can represent any real numbers.

a) $\sqrt{y^2} = |y|$

b) $\sqrt[3]{8y^6} = \sqrt[3]{2^3 (y^2)^3}$
$= 2y^2$

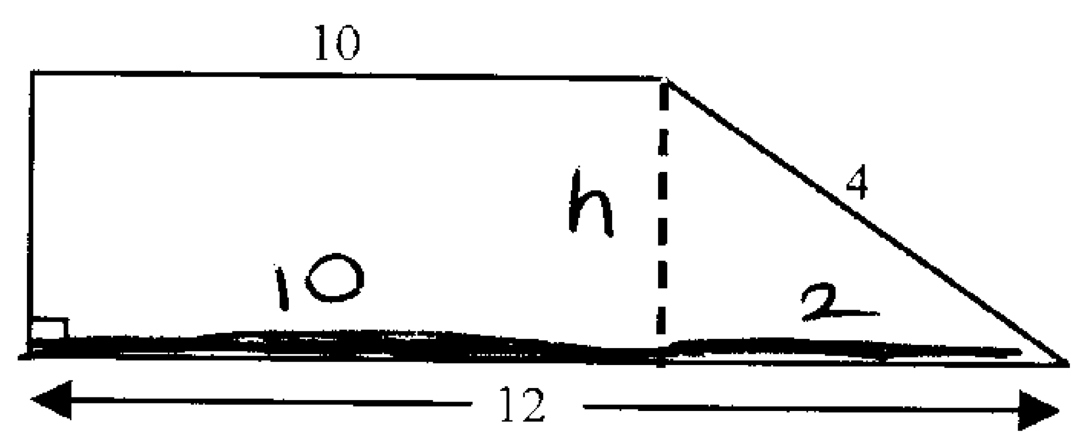
c) $\sqrt{50} = \sqrt{5^2 \cdot 2}$
$= 5\sqrt{2}$

d) $\sqrt{x^2 + 4}$ ✓

e) Expand $(\sqrt{x} - 4)^2 = (\sqrt{x})^2 - 2(\sqrt{x})4 + 4^2$
$= x - 8\sqrt{x} - 16$

Ex. 10: Find the area of the given trapezoid.

$A = \frac{1}{2}h(b_1 + b_2)$.



Phy. Theorem.

$h^2 + 2^2 = 4^2$

$h^2 = 16 - 4 = 12$

$h = \sqrt{12}$

$\boxed{h = 2\sqrt{3}}$

$A = \frac{1}{\cancel{2}} \cancel{2}\sqrt{3}\,(10+12)$

$\boxed{A = 22\sqrt{3}}$

Equation Solving (*R*.7)

Ex. 11: Solve:

a) $3-(2x+5) = -4(x+7)$

$3 - 2x - 5 = -4x - 28$

$-2x - 2 = -4x - 28$

$-2x = -4x - 26$

$2x = -26 \Rightarrow \boxed{x = -13}$

b) $-2(x+5)(2x-3) = 0$

$x + 5 = 0$

$\boxed{x = -5}$

$2x - 3 = 0$

$2x = 3$

$\boxed{x = 3/2}$

c) $x^2 - 3x = 4$

$x^2 - 3x - 4 = 0$

$-4 \quad 1$

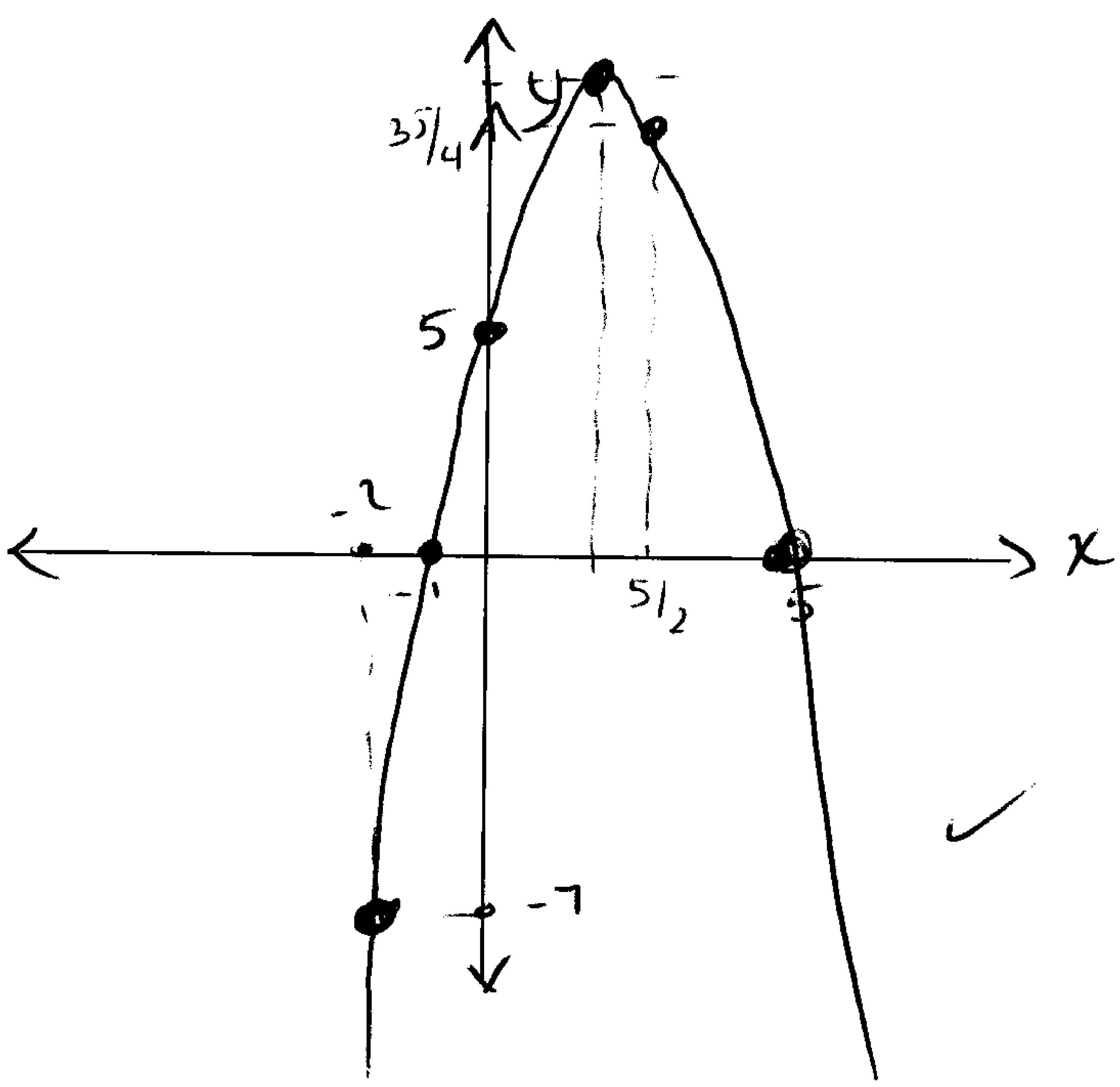
$(x-4)(x+1) = 0$

$\boxed{x = 4}$ $\boxed{x = -1}$

Introduction to Graphing

Ex. 12: Compute the following table, then graph the quadratic $y = -x^2 + 4x + 5$.

x	y
0	5
−1	0
−2	−7
5	0
$\frac{5}{2}$	$\frac{35}{4}$
2	9



Recommended Review Homework:

R.1: #13, 15, 23
R.2: #13, 23, 39, 47, 87
R.3: #9, 31, 41
R.4: #3, 9, 29, 31, 43, 51, 61, 69, 117, 119
R.5: #3, 11, 15, 37, 39, 55, 57
R.6: #3, 5, 13, 23, 29, 51, 55, 59, 61, 71, 89, 91, 97, 109, 113
R.7: 25, 31, 39, 45, 51
Worksheet A – Intro to Graphing Handout (in Appendix)

Additional Notes/Written Homework

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