Honors Math 2 – Things to Remember for Midterm

Transformations

Reflections

$r_{x-axis}\ (x,y) \rightarrow (x,-y)$
$r_{y-axis}\ (x,y) \rightarrow (-x,-y)$
$r_{y=x}\ (x,y) \rightarrow (y,x)$
$r_{y=-x}\ (x,y) \rightarrow (-y,-x)$

Rotations (counterclockwise)

$R_{90\ degrees}\ (x,y) \rightarrow (-y,x)$
(Same as 270 clockwise)
$R_{180\ degrees}\ (x,y) \rightarrow (-x,-y)$
$R_{270\ degrees}\ (x,y) \rightarrow (y,-x)$
(Same as 90 clockwise)

Translations

$(x,y) \rightarrow (x \pm \#, y \pm \#)$

Dilations

$D_k\ (x,y) \rightarrow (kx,ky)$

Rotational Symmetry: A rotation which the figure is its own image. To find the rotational degrees where a polygon will rotate onto its own image, take 360/(# of sides)

Adding or Subtracting Polynomials

Combine like terms

$(3x^2 - 4 + 2x) + (5x - 6x^2 + 7)$
$= -3x^2 + 7x + 3$
$(3x^2 - 4 + 2x) - (5x - 6x^2 + 7)$
$= 9x^2 - 3x - 11$

Multiplying Polynomials

Multiply: (distribute or foil or box)

$(4x + 3)(x + 2) = 4x^2 + 11x + 6$

or

$(2x + 3)(x^2 - 3x + 9)$
$= 2x^3 - 6x^2 + 18x$
$+ 3x^2 - 9x + 27$
$= 2x^3 - 3x^2 + 9x + 27$

Similarity

Two figures are similar if they have all corresponding angles congruent AND if all corresponding sides are proportional (must have the same scale factor for all sides)

Ways to Prove Triangles Similar

AA~ SSS~ SAS~

Set full sides equal to full sides, not parts of sides

Congruence

Two figures are congruent if all corresponding angles and sides are congruent.

Ways to Prove Triangles Congruent

SSS SAS ASA AAS HL

__NEVER__ ASS OR SSA

Corresponding parts of congruent triangles are always congruent

➔ Find missing angles, sides, and variables by setting corresponding parts of congruent triangles equal

Triangles

Scalene – no congruent sides
Isosceles – at least 2 congruent sides
Base angles of isosceles triangles are congruent
Equilateral – 3 congruent sides

Acute – all angles <90 degrees
Right – one 90 degree angle
Obtuse – one obtuse angle (>90)

Equiangular – 3 congruent angles
Equilateral↔Equiangular

Mid-segments of triangles are half the length of their parallel side.

Solve Quadratic Equations

$= ax^2 + bx + c = 0$

Must be set equal to 0 at first

Set each factor equal to zero & solve

$x^2 - 5x + 6 = 0$ so $(x - 3)(x + 2)$
so $x = 3$ & -2

Factoring:

Look to see if there a GCF (greatest common factor) first!

$ab + ac = a(b + c)$

Factor 4 terms (Grouping):

Check for GCF of all terms first.
Factor out GCF of the first two terms.
Factor out GCF of the last two terms.
Combine like terms - Bring the coefficients (GCFs) together as a binomial and place the shared binomial at the back.

Factor 3 terms:

Find two numbers that multiply to give a*c but add to give b value
Use those two numbers to "bust the b" term and factor by grouping

Factor 4 terms (Grouping):

Check for GCF first. Place all 4 terms into a box and factor.

Difference of Squares:

$(a^2 - b^2) = (a - b)(a + b)$

Square roots:

Isolate the variable and take the square root of each side.

$if\ x^2 = m, then\ x = \pm\sqrt{m}$

Quadratic Formula

$ax^2 + bx + c = 0$

Must set equal to 0 BEFORE solving

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Discriminant: tells info about roots

$b^2 - 4ac > 0$ Two real roots
Perfect Square: Rational roots
Non perfect square: Irrational roots
Graph has two x-intercepts

$b^2 - 4ac = 0$ One real roots
This root will be repeated 2 times
Graph has one x-intercept

$b^2 - 4ac < 0$ Zero real roots
Two imaginary/complex roots
Graph will have zero x-intercepts

Graphing Parabolas

Axis of symmetry: $\frac{-b}{2a}$

Vertex: $\left(\frac{-b}{2a}, f\left(\frac{-b}{2a}\right)\right)$ *Substitute the axis of symmetry into the function*

+a: parabola has a min. & opens up
-a: parabola has a max. & opens down

Domain for parabolas: all real numbers
Range: Look at the y-value of vertex.
y is $\geq$ or $\leq$ this number

Function Transformations

f(-x) is refl. over y-axis like $y = (-x)^2$
-f(x) is refl. over x-axis like $y = -x^2$
f(x) + k is translated up k
f(x) – k is translated down k
f(x – h) is translated right h
f(x + h) is translated left h
af(x) is vertical stretch if a > 1
af(x) is vertical compression if 0<a<1

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Solving Exponential Equations

$b^x = b^y$ *then* $x = y$ because bases are same

$x^b = y^b$ *then* $x = y$ because exponents are same

Exponent Rules

$$x^m * x^n = x^{m+n}$$
$$\frac{x^m}{x^n} = x^{m-n}$$
$$x^{-n} = \frac{1}{x^n} \text{ or } \frac{1}{x^{-n}} = x^n$$
$$(x^m)^n = x^{m*n}$$
$$x^m * x^n = x^{m+n}$$
$$\left(\frac{x^m}{x^n}\right)^p = \frac{x^{mp}}{x^{np}}$$
$$(x^m y)^n = x^{mn} y^n$$
$$x^0 = 1, x \neq 0$$

Exponent Form:	**Radical Form**:
$\sqrt[3]{x^2} or (\sqrt[3]{x})^2$	$x^{\frac{2}{3}}$

Exponential Growth and Decay

Exponential Growth

$y = ab^x$ *where* $a > 0$ *and* $b > 1$

b = 1 + r (r is the % converted to a decimal)

Exponential Decay

$y = ab^x$ *where* $a > 0$ *and* $0 < b < 1$

b = 1 – r (r is the % converted to a decimal)

Half Life

$$y = a\left(\frac{1}{2}\right)^{\frac{x}{halflife\ time}}$$

Simplifying Radicals

1) Factor the Radicand
2) Group according to size equal to index (Look for perfect squares, cubes, etc according to the index)
3) Bring out a "representative" from each group
4) Multiply coefficients and radicands (multiply outside values and inside values)
5) Always be sure you can't simplify or break up the radical more

Adding/Subtracting Radicals

You can only add/subtract "like" radicals – they must have the same index and radicand

1) Simplify the Radical completely
2) If you have "like" radicals, then add/subtract the coefficients

Multiplying Radicals

To multiply radicals with the same index

1) Multiply the coefficients and radicands (do "outside * outside & inside * inside)
2) Simplify the Radical completely

Solving Equations with Radicals

1) Isolate the Radical part
2) Raise both sides to the index
3) Solve
4) Check for extraneous solutions

Extraneous solutions are roots that are not true solutions because they do not work in the original problem

Solving Equations with Rational Exponents

1) Isolate the Rational Exponent part
2) Raise both sides to the reciprocal power
3) Solve
4) Check for extraneous solutions