Topics for Test 2 MATH 106

The kinds of problems in the Chapter Test, who answers I've posted. The topics there include:

- All kinds of factoring: by GCF, grouping, reverse FOIL and special products:

  $x^2 - y^2 = (x + y)(x - y)$
  $x^3 - y^3 = (x - y)(x^2 + xy + y^2)$
  $x^3 - y^3 = (x - y)(x^2 + xy + y^2)$

  Plus the bonus: $x^2 - 7$ (for ex) which factors as $(x + \sqrt{7})(x - \sqrt{7})$

- Solving equations by factoring
- Physics word problem: solve for t given height h of a ball thrown from a height or in an arc.
- Long division of polynomials without remainder and with remainder
- Remainder theorem: If P(x) has a factor of $x - r$, then the remainder $P(r) = 0$ (that is, r is a root).

  If the remainder P(r) is not equal to zero, then $x - r$ is not a factor of P(x). (see example next page)

Other:

- Number sets N, W, Z, Q, Q', R and examples of each kind. Know which sets are subsets of others.
- Rules of exponents (i.e., monomial division), including negative exponent simplification
- Numeric values of first 10 perfect squares and first 5 perfect cubes
- Showing numeric relationship using rules of exponents:

  Example: $2^{32} - 2^{31} = 2^{31}(2 - 1) = 2^{31}(1) = 2^{31}$

- Common mistakes (freshman mistake $x^2 + y^2 = (x + y)^2$ (it doesn't!!!!!!!!!)
- $(x - y) / (y - x) = -1$
- Recognize what is meant by the Fundamental Theorem of Algebra (a polynomial of degree n has a unique factorization into n factors $(x - r)$, where r is a root, and it can be a real number, a rational number, an irrational number or an imaginary number.
- Primes: 2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, ...
- Twin primes: e.g. 3 and 5; 5 and 7; 11 and 13; 17 and 19; 29 and 31)
- Words of the month: mundane, volition, ambient, paucity, penultimate, edify or edification (Use two of these in sentences.)

Ex Remainder thm:

Q: Is $x = -2$ a root of $P(x) = x^5 - 2x^4 + x^2 - 2$?

A: Calculate $P(-2) = (-2)^5 - 2(-2)^4 + (-2)^2 - 2$

$= -32 - 32 + 4 - 2$

$= -62$

Since $P(-2) \neq 0$, then $x = -2$ is not a root.

Q: Is $x+2$ a factor of $P(x)$ above?

A: No, since if it were a factor, then $x = -2$ would be a root. [Note that

$x + 2 = x - (-2)$]

Q: Find the remainder when $P(x) = x^3 - 2x^2 + 3x - 1$ is divided by $x - 1$.

A: Instead of doing the long division, just find $P(1)$, since this gives the remainder of division of $x-1$ into $P(x)$.

$$P(1) = 1^3 - 2(1^2) + 3(1) - 1 = 1$$

Q: Find the remainder when $P(x) = x^3 - 2x^2 + 3x - 1$ is divided by $x + 1$.

A: Division by $x+1$ gives the same remainder as $P(-1)$ (notice the sign change).

$$P(-1) = (-1)^3 - 2(-1)^2 + 3(-1) - 1 = -7$$