The first section of the quarter will involve a lot of factoring of polynomials.
We will not spend time on reviewing factoring in lectures.

Instead, test yourself on the material below.
If you have a lot of difficulty with it, practice the factoring review sections in Enable.

Also, consider going to the Tutorial Center as soon as possible and signing up for a free individual tutor for the quarter.

[1] Without trying to divide the number, how can you tell quickly if a number is divisible by

(a) 2 ?
(b) 3 ?
(c) 5 ?

[2] Factor the following numbers completely into a product of powers of prime numbers.

Example: 8316

$= 2 \times 4158$

$= 2 \times 2 \times 2079$

$= 2 \times 2 \times 3 \times 693$

$= 2 \times 2 \times 3 \times 3 \times 231$

$= 2 \times 2 \times 3 \times 3 \times 3 \times 77$

$= 2 \times 2 \times 3 \times 3 \times 3 \times 7 \times 11$

$8316 = 2^2 \times 3^3 \times 7 \times 11$

OR

$2 \mid \underline{8316}$
$2 \mid \underline{4158}$
$3 \mid \underline{2079}$
$3 \mid \underline{693}$
$3 \mid \underline{231}$
$7 \mid \underline{77}$
$11 \mid \underline{11}$
1

(a) 108 (b) 315

(c) 1008 (d) 1617

[3] Multiply and simplify the following products of polynomials.

Example: $(7x-4)(2x-9) = 14x^2 - 63x - 8x + 36 = 14x^2 - 71x + 36$

(a) $-2x^2(x-4)(x+6)$ (b) $(6x+11)(3x+7)$

(c) $(9x-5)(9x+5)$ (d) $4(5x+2)(8x-3)$

[4] Determine if the first polynomial is a factor of the second polynomial.
If yes, factor the second polynomial.
If no, write "**not a factor**".

Example 1: Is $3x-7$ a factor of $12x^2+14x-35$?

To get the $12x^2$ term, the other factor must have a $4x$ term (since $(3x)(4x)=12x^2$)
To get the -35 term, the other factor must have a $+5$ term (since $(-7)(+5)=-35$)
But $(3x-7)(4x+5) = 12x^2-13x-35 \neq 12x^2+14x-35$
So, $3x-7$ is **not a factor** of $12x^2+14x-35$

Example 2: Is $8x+3$ a factor of $40x^2-41x-21$?

To get the $40x^2$ term, the other factor must have a $5x$ term (since $(8x)(5x)=40x^2$)
To get the -21 term, the other factor must have a -7 term (since $(+3)(-7)=-21$)
And $(8x+3)(5x-7) = 40x^2-41x-21$

(a) Is $4x-9$ a factor of $12x^2-19x-18$?

(b) Is $5x+2$ a factor of $15x^2+39x+14$?

(c) Is $7x-5$ a factor of $21x^2-44x+20$?

(d) Is $6x+11$ a factor of $12x^2+4x-33$?

[5] Factor the following polynomials completely.
Factor out any leading negatives **first**.

Example 1: $6-5x-x^2 = -(x^2+5x-6) = -(x+6)(x-1)$

Example 2: $3x^2-60x+108 = 3(x^2-20x+36) = 3(x-2)(x-18)$

Example 3: $150-6x^2 = -6(x^2-25) = -6(x+5)(x-5)$

Example 4: $6x^2+7x-5 = (3x+5)(2x-1)$

Example 5: $5x^5-60x^4+180x^3 = 5x^3(x^2-12x+36) = 5x^3(x-6)^2$

(a) $3x^2+24x+48$

(b) $27x^5-12x^3$

(c) $6+11x-2x^2$

(d) $4x^2-20x+9$

(e) $2x^3-10x^2-48x$

(f) $48+13x-x^2$

ANSWERS

[1] (a) if the units (rightmost) digit is 0, 2, 4, 6 or 8

(b) if the digits add up to a multiple of 3

(c) if the units digit is 0 or 5

[2] (a) $2^2 \times 3^3$

(b) $3^2 \times 5 \times 7$

(c) $2^4 \times 3^2 \times 7$

(d) $3 \times 7^2 \times 11$

[3] (a) $-2x^4 - 4x^3 + 48x^2$

(b) $18x^2 + 75x + 77$

(c) $81x^2 - 25$

(d) $160x^2 + 4x - 24$

[4] (a) Yes. $(4x-9)(3x+2) = 12x^2 - 19x - 18$

(b) Not a factor. $(5x+2)(3x+7) = 15x^2 + 41x + 14 \neq 15x^2 + 39x + 14$

(c) Not a factor. $(7x-5)(3x-4) = 21x^2 - 43x + 20 \neq 21x^2 - 44x + 20$

(d) Yes. $(6x+11)(2x-3) = 12x^2 + 4x - 33$

[5] (a) $3(x+4)^2$

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

(c) $-(2x+1)(x-6)$

(d) $(2x-1)(2x-9)$

(e) $2x(x-8)(x+3)$

(f) $-(x-16)(x+3)$