3.5: Fundamental Theorem of Algebra

<u>Fundamental Theorem of Algebra</u>: if the degree of a polynomial is *n*, then there are *n* (not necessarily distinct) zeros.

<u>Recall</u>:

1. Complex roots come in pairs.

2.
$$i = \sqrt{-1}$$
 and $i^2 = -1$

Factor down to linear factors.

$$4x^{3} - 12x^{2} + 9x - 27$$

$$4x^{2}(x-3) + 9(x-3)$$

$$(4x^{2} + 9)(x-3)$$

$$(2x-3i)(2x+3i)(x-3)$$

Find all zeros and factor down to linear factors.

$$x^{2} + x^{3} + x^{2} + 9x - 10$$

$$-\frac{1}{2} + \frac{1}{2} + \frac{1}{2} + \frac{1}{2} = \frac{1}{2}$$

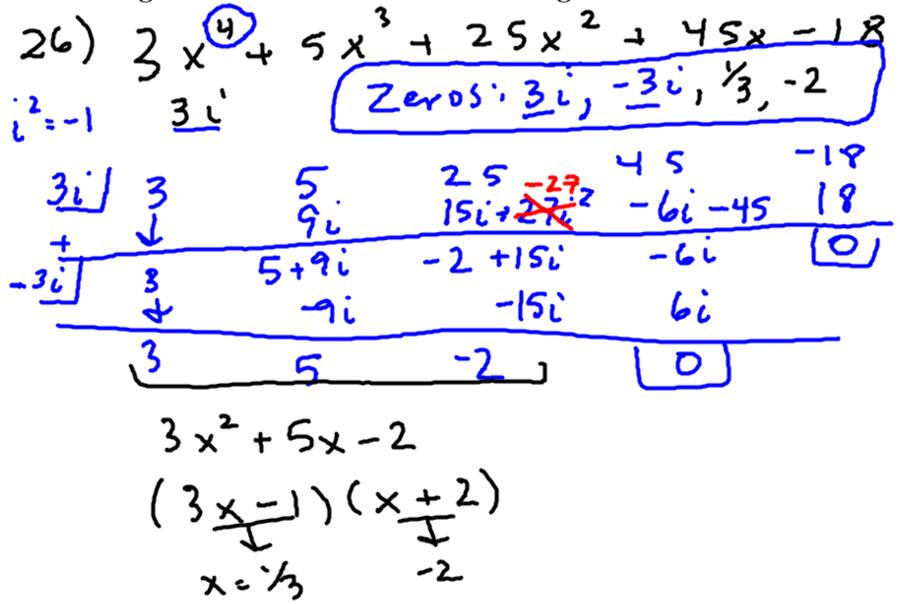
$$-\frac{1}{2} + \frac{1}{2} + \frac{1}{2} = \frac{1}{2}$$

$$(x-1)(x+2)(\frac{x^2-2x+5}{x^2-2x+5})$$

$$x = \frac{2 \pm \sqrt{(-2)^2-4(1)(5)}}{2(1)} = \frac{2 \pm \sqrt{-11}}{2}$$

$$= 2 \pm 4i = 1 \pm 2i$$

Use the given zero to find the remaining zeros of each function.



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