Section 5.3:

#1 – 12: Create a function with lead coefficient 1 that satisfies the conditions.

1) degree 2; zeros 3i and -3i

$$X = 3i \qquad X = -3i$$
$$X - 3i = 0 \qquad X + 3i = 0$$

$$f(x) = (x - 3i)(x + 3i)$$
$$X \cdot X \quad X \cdot 3i \quad -3iX \quad -3i \cdot 3i$$

$$f(x) = x^2 + 3xi - 3xi - 9i^2$$

$$f(x) = x^2 - 9i^2$$
$$f(x) = x^2 - 9(-1)$$
$$f(x) = x^2 + 9$$

3) degree 3; zeros -4 and 5i and -5i

$$X = -4 \qquad X = 5i \qquad X = -5i$$
$$X + 4 = 0 \qquad X - 5i = 0 \qquad X + 5i = 0$$

$$f(x) = (x - 5i)(x + 5i)(x + 4)$$

$$f(x) = (x^2 + 5xi - 5xi - 25i^2)(x + 4)$$

$$f(x) = (x^2 - 25i^2)(x + 4)$$
$$\xrightarrow{} -25(-1)$$

$$f(x) = (x^2 + 25)(x + 4)$$

$$x^2 \cdot x \qquad x^2 \cdot 4 \qquad 25 \cdot x \qquad 25 \cdot 4$$

$$\boxed{f(x) = x^3 + 4x^2 + 25x + 100}$$

5) degree 3; zeros 2 and 3i ← Also −3i must be
a zero

$$X = 2$$
$$X - 2 = 0 \qquad X = 3i \qquad X = -3i$$
$$X - 3i = 0 \qquad X + 3i = 0$$

$$f(x) = (X - 3i)(X + 3i)(X - 2)$$
$$f(x) = (X^2 + 3Xi - 3Xi - 9i^2)(X - 2)$$
$$-9(-1)$$
$$+9$$

$$f(x) = (X^2 + 9)(X - 2)$$
$$X^2 \cdot X \qquad X^2 \cdot -2 \qquad 9 \cdot X \qquad 9 \cdot -2$$

$$f(x) = X^3 - 2X^2 + 9X - 18$$

7) degree 4; zeros 2i, and 6i

Also $-2i, -6i$

$X = 2i \qquad X = -2i \qquad\qquad X = 6i \qquad X = -6i$

$X - 2i = 0 \qquad X + 2i = 0 \qquad X - 6i = 0 \qquad X + 6i = 0$

$f(x) = (x-2i)(x+2i)(x-6i)(x+6i)$

$f(x) = (x^2 + 2xi - 2xi - 4i^2)(x^2 + 6xi - 6xi - 36i^2)$

$\qquad\qquad\qquad\quad -4(-1) \qquad\qquad\qquad\quad -36(-1)$

$f(x) = (x^2 + 4)(x^2 + 36)$

$\qquad\qquad\quad x^2 \cdot x^2 \quad x^2 \cdot 36 \quad 4 \cdot x^2 \quad 4 \cdot 36$

$f(x) = x^4 + 36x^2 + 4x^2 + 144$

$\boxed{f(x) = x^4 + 40x^2 + 144}$

9) degree 2; zero 3+i

Sorry for tHis one

$x = 3+i$ $x = 3-i$

$x - 3 - i = 0$ $x - 3 + i = 0$

$f(x) = (x-3-i)(x-3+i)$

$x \cdot x \quad x \cdot -3 \quad x \cdot i \quad -3x \quad -3 \cdot -3 \quad -3i \quad -ix \quad -i \cdot -3$
$\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad -i \cdot i$

$f(x) = x^2 - 3x + xi - 3x + 9 - 3i - xi + 3i - i^2$

$i^2 = -1$

$f(x) = x^2 - 3x - 3x + 9 - (-1)$

$\boxed{f(x) = x^2 - 6x + 10}$

11) degree 2; zero 5 - i

$$x = 5 + i \qquad x = 5 - i$$
$$x - 5 - i = 0 \qquad x - 5 + i = 0$$

$$f(x) = (x - 5 - i)(x - 5 + i)$$

$x \cdot x \quad x \cdot -5 \quad x \cdot i \quad -5 \cdot x \quad -5 \cdot -5 \quad -5 \cdot i \quad -ix \quad -i \cdot -5 \quad -i \cdot i$

$-i^2$
$= -(-1)$

$$f(x) = x^2 - 5x + xi - 5x + 25 - 5i - xi + 5i + 1$$

$$f(x) = x^2 - 5x - 5x + 25 + 1$$

$$\boxed{f(x) = x^2 - 10x + 26}$$