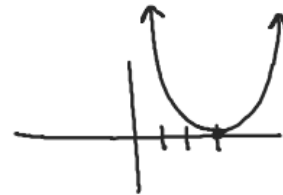Consider the functions $r(x)$ and $s(x)$, where
$r(x) = (x-3)^2$ and $s(x) = (x+3)^2$

What is the degree of $r(x)$? $s(x)$?

$r(x)$

Degree = 2

$s(x)$

Degree = 2

$(x-3)(x-3)$

$x-3=0$ $x-3=0$

$x=3$ $x=3$

What are the zeros of $r(x)$? $s(x)$?

$r(x)$
Zeros
$x=3$

$s(x)$
Zeros
$x=-3$

Consider the function $t(x) = (x-3)(x+4)^2$

a. Expand the expression that defines $t(x)$. Identify the degree of the resulting polynomial.

$t(x) = (x-3)(x^2+8x+16)$

$x^3 + 8x^2 + 16x$
$\quad -3x^2 - 24x - 48$

$x^3 + 5x^2 - 8x - 48$

b. What are the zeros $t(x)$?

$x = 3, -4$

Multiplicity odd
Cross X-axis

Multplicity even
Does not cross
X-axis
touch and turn

State the degree and list the zeros of the polynomial function. State the multiplicity of each zero and whether the graph crosses the x-axis at the corresponding x-intercept. Graph the function on your calculator to verify your answer.

a) $f(x) = x(x + 2)^2$

Degree = 3

Zeros	mult	
$x = 0$	1	Cross
$x = -2$	2	touch

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

Degree = 5

Zeros	mult	
$x = -3$	3	Cross
$x = 1$	2	touch

c) $f(x) = x^3(x - 4)$

Degree = 4

Zeros	mult	
$x = 0$	3	Cross
$x = 4$	1	Cross

d) $f(x) = 3x(x - 2)^3(x - 1)^2$

Degree = 6

Zeros	mult	
$x = 0$	1	Cross
$x = 2$	3	Cross
$x = 1$	2	touch

Find the polynomial function with leading coefficient 1 that has the given degree and zeros. Integer

A) Degree 3, with 2, -1, and 4 as zeros

Zeros $x = 2$ $x = -1$ $x = 4$

Linear Factor $(x-2)$ $(x+1)$ $(x-4)$

$(x-2)(x^2 - 3x - 4)$

$x^3 - 3x^2 - 4x$
$\quad - 2x^2 + 6x + 8$

$x^3 - 5x^2 + 2x + 8$

B) Degree 3 with 5, 1/3, and 2/3 as zeros

$$X = 5 \qquad X = \frac{1}{3} \qquad X = \frac{2}{3}$$

Write a polynomial function of minimum degree in factored form with real coefficients whose zeros and their multiplicities include those listed. Then sketch a graph and discuss what you notice.

a) 3 (multiplicity 2), - 4 (multiplicity 3)

b) 3 (multiplicity 3), - 4 (multiplicity 1)

1 (multiplicity 2), -2 (multiplicity 3)