

Math 1 — Worksheet 3

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Name: KEY

For each of the following polynomials, complete the following steps:

- Factor the polynomial
- Find the zeros of the polynomial
- Determine the long run behavior

1. $f(x) = x^3 - 4x$

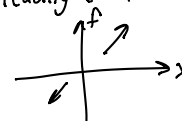
(i) $x^3 - 4x$
 $x(x^2 - 4)$

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

(ii) $x(x-2)(x+2) = 0$

$x=0$	$x=2$	$x=-2$
mult 1	mult 1	mult 1

(iii) degree 3
 leading coeff > 0



i.e. as $x \rightarrow \infty$, $f(x) \rightarrow \infty$
 as $x \rightarrow -\infty$, $f(x) \rightarrow -\infty$

2. $g(x) = -2x^4 - x^3 + 3x^2$

(i) $-2x^4 - x^3 + 3x^2$
 $-x^2(2x^2 + x - 3)$
 $-x^2(2x^2 + 3x - 2x - 3)$
 $-x^2(x(2x+3) - 1(2x+3))$

$g(x) = -x^2(2x+3)(x-1)$

(ii) $-x^2(2x+3)(x-1) = 0$

$x=0$	$x=-3/2$	$x=1$
mult 2	mult 1	mult 1

(iii) degree 4
 leading coeff < 0



i.e. as $x \rightarrow \infty$, $g(x) \rightarrow -\infty$
 as $x \rightarrow -\infty$, $g(x) \rightarrow -\infty$

3. $h(x) = -x^3 - 5x$

(i) $-x^3 - 5x$

$h(x) = -x(x^2 + 5)$

(ii) $-x(x^2 + 5) = 0$

$x=0$	$x^2+5=0$
mult 1	has no real solution

(iii) degree 3
 leading coeff < 0



i.e. as $x \rightarrow \infty$, $h(x) \rightarrow -\infty$
 as $x \rightarrow -\infty$, $h(x) \rightarrow \infty$

4. $k(x) = 2x^4 + x^2 - 3$

(i) $2x^4 + x^2 - 3$
 $2(x^2)^2 + x^2 - 3$
 $u = x^2$

$2u^2 + u - 3$
 $2u^2 + 3u - 2u - 3$
 $u(2u+3) - 1(2u+3)$
 $(u-1)(2u+3)$
 $(x^2-1)(2x^2+3)$

$k(x) = (x-1)(x+1)(2x^2+3)$

(ii) $(x-1)(x+1)(2x^2+3) = 0$

$x=1$	$x=-1$	$2x^2+3=0$
mult 1	mult 1	has no real solution

(iii) degree 4
 leading coeff > 0



i.e. as $x \rightarrow \infty$, $k(x) \rightarrow \infty$
 as $x \rightarrow -\infty$, $k(x) \rightarrow \infty$

Using your work on the previous page, match the functions with A–D in the graph below.

1. D $f(x) = x^3 - 4x$
2. C $g(x) = -2x^4 - x^3 + 3x^2$
3. B $h(x) = -x^3 - 5x$
4. A $k(x) = 2x^4 + x^2 - 3$

