

MA115 :: Sections 3.1 & 3.2 & 3.3 Polynomials, Long Division & Rational Zeros

1. The leading term governs the *end behavior*. Describe the end behavior for these functions  $f(x) = x^2$ ,  $f(x) = x^2 + x$ ,  $f(x) = -x^3$ ,  $f(x) = -x^3 + 10x^2$ ,  $h(x) = 1/x$ ,  $g(x) = \frac{-2x^2 + x + 1}{x+1}$

| $f(x)$         | $f(x) \rightarrow \square$ as $x \rightarrow \infty$ | $f(x) \rightarrow \square$ as $x \rightarrow -\infty$ |  |
|----------------|--|---|--|
| $x^2$          | $\infty$   | $\infty$  |  |
| $x^2 + x$      | $\infty$   | $\infty$  |  |
| $-x^3 + 10x^2$ | $-\infty$  | $-(-x)^3 \rightarrow \infty$                          |  |
| $1/x$          | $1/ \infty  \rightarrow 0$                           | $1/ \infty  \rightarrow 0$                            |  |
|                | $-\infty$  | $\infty$  |  |

$-\frac{2x^2 + x + 1}{x+1} \approx -\frac{2x^2}{x} = -2x$

2. Graph by hand  $P(x) = x^6(x-3)^5(x+2)^2$ . Check your answer by plotting using a graphing utility using a window  $-1 \leq x \leq 3.5$ .

Zeros:

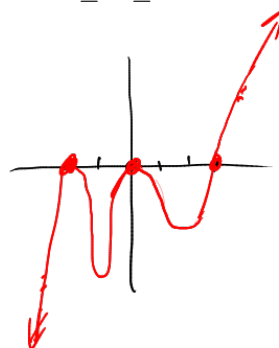
0, 3, -2

multiplicity:

6 even, 5 odd, 2 even

shape:

$\leftarrow \rightarrow x$  or  $\leftarrow \rightarrow x$  (kiss)  
 $\leftarrow \nearrow x$  or  $\leftarrow \nearrow x$  (pierce)  
 $\leftarrow \rightarrow x$  or  $\leftarrow \rightarrow x$  (kiss)



End Behavior

Total degree:

$6 + 5 + 2 = 13$

(odd)

coef of leading term

$= 1 > 0$