32) $4x^4 - 8x^3 - 19x^2 + 23x - 6$

deg 4 same

EB

$\lim_{x \to \infty} f(x) = \infty$

$\lim_{x \to -\infty} f(x) = \infty$

graph (d)

check $f(-2) = 0$

68) $V = 2666x - 210x^2 + 4x^3$

$V = 4x^3 - 210x^2 + 2666x$

$2x(2x^2 - 105x + 1333)$

2666

$1 \quad 2666$

$2 \quad 1333$

QF $x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $x = 31$ & 21.5

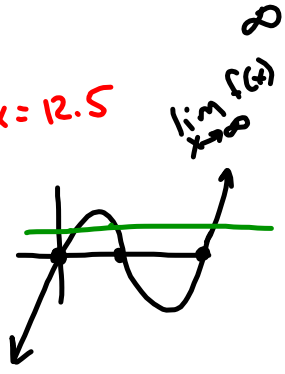
67) Y_1 $V = x(10 - 2x)(25 - 2x)$

reasonable domain to consider

$x = 0$ $x = 5$ $x = 12.5$

$0 \le x \le 5$

$Y_2 = 175$



2.4 Real Zeros of Polynomial Functions

Let $f(x)$ and $d(x)$ be polynomials with the degree of f greater than or equal to the degree of d and $d(x) \neq 0$

There are unique polynomials $q(x)$ and $r(x)$ such that:

$$f(x) = d(x) \cdot q(x) + r(x)$$

divisor quotient remainder

$6\overline{)12503}$

Ex 1 Polynomial Long Division

Use long division to find the quotient and remainder

when $2x^4 - x^3 - 2$ is divided by $2x^2 + x + 1$

$$\begin{array}{r} x^2 - x \\ 2x^2+x+1 \overline{)\,2x^4 - x^3 + 0x^2 + 0x - 2} \\ -(2x^4 + x^3 + x^2) \\ \hline -2x^3 - 1x^2 + 0x \\ -(-2x^3 - x^2 - 1x) \\ \hline x - 2 \end{array}$$

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

quotient remainder

THEOREM Remainder Theorem

If a polynomial $f(x)$ is divided by $x - k$, then the remainder is $r = f(k)$.

Ex 2 Using the Remainder Theorem

Find the remainder when $f(x) = 3x^2 + 7x - 20$ is divided by

a) $x - 2$ $=0$

$f(2) = \#r$

$3(2)^2+7(2)-20$

$f(2)=6$

b) $x + 1$

$f(-1)$

$3(-1)^2+7(-1)-20$

$f(-1)=-24$

c) $x + 4$

$f(-4)$

$3(-4)^2+7(-4)-20$

$f(-4)=0$

What does each mean?

THEOREM Factor Theorem

A polynomial function $f(x)$ has a factor $x - k$ if and only if $f(k) = 0$.

↑ divides evenly

Ex 3 Synthetic Division

Divide $2x^3 - 3x^2 - 5x - 12$ by $x - 3$ 2nd $x=3$

3 | 2 -3 -5 -12

↓ 6 9 12

→ 2 3 4 0

$2x^2 + 3x + 4$

$\frac{2x^3-3x^2-5x-12}{x-3}$

$x \neq 3$

p223 # 2,4,5,7,9,10,14,16,17
19,21,23,24