7) $-x^4+2x$

degree: 4

EB: same ↙ ↘

4) $f(x)=\frac{2}{3}(x-3)^3+1$

monomial $\frac{2}{3}x^3$

right 3 units

up 1 unit

y-int $(0,-17)$

$\frac{2}{3}(0-3)^3+1$

$\frac{2}{\cancel{3}_1}\left(\frac{-\cancel{27}^{-9}}{1}\right)+1$

$-18+1=-17$

More 2.3 Polynomials of Higher Degree

Zeros of a Polynomial- where $f(x)=0$

aka zeros, roots, solutions, x-intercept

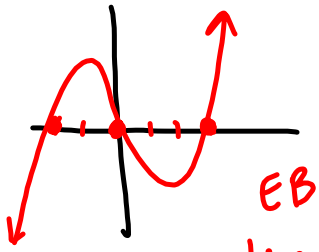
Ex 5 Finding the zeros of a polynomial

$$f(x) = x^3 - x^2 - 6x$$

$0 = x(x^2 - x - 6)$

$0 = x(x-3)(x+2)$

$x=0 \quad x=3 \quad x=-2$



EB diff

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

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

DEFINITION Multiplicity of a Zero of a Polynomial Function

If f is a polynomial function and $(x-c)^m$ is a factor of f but $(x-c)^{m+1}$ is not, then c is a zero of **multiplicity** m of f.

Zeros of Odd and Even Multiplicity

If a polynomial function f has a real zero c of odd multiplicity, then the graph of f crosses the x-axis at $(c, 0)$ and the value of f changes sign at $x = c$.

If a polynomial function f has a real zero c of even multiplicity, then the graph of f does not cross the x-axis at $(c, 0)$ and the value of f does not change sign at $x = c$.

bounces

Ex 6 Sketching the Graph of a Factored Polynomial

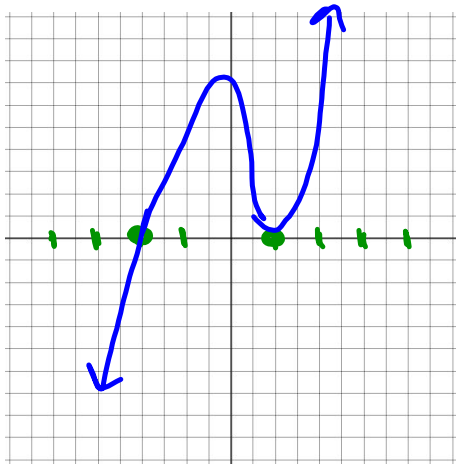
$f(x) = (x + 2)^3(x - 1)^2$

Degree? 5

Zeros? $x = -2$ $x = 1$

Multiplicity? $x = -2$: mult. 3, cross; $x = 1$: mult. 2, bounce

Sketch a graph



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

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

y-intercept? (0, 8)

Ex 8- Zoom to uncover hidden behavior

Ex 9 Designing a Box

Dixie Packaging Company has contracted to make boxes with a volume of approximately 484 in.^{3}. Squares are to be cut from the corners of a 20-in. by 25-in. piece of cardboard, and the flaps folded up to make an open box. (See Figure 2.31.) What size squares should be cut from the cardboard?

$V(x) = x(20-2x)(25-2x)$

$x=0$ $x=10$ $x=12.5$

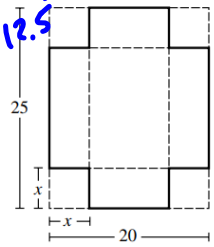


FIGURE 2.31

Numerically

since $20-2x$ yields $x=10$

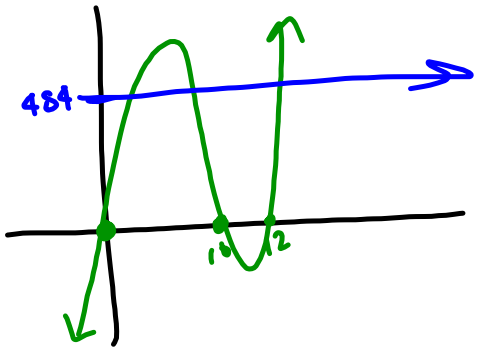
Domain to consider $0 \le x \le 10$

Using table in calc, where about does 484 show up? between 1 & 2 AND between 6 & 7

Graphically

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

$Y_2 = 484$ horizontal line



Suggested window

[0, 10] [0, 500]

scl 100

Find the intersections

2nd Calc: Intersections ...

(1.2, 484) and (6.8, 484)

p209 #32, 33, 36, 38, 39, 40, 41, 67, 79