

---

## Section 3.2: Curve Sketching Polynomials

---

### 1. INTERCEPTS:

- x-intercepts: let  $y = 0$ , and solve for  $x$
- y-intercepts: let  $x = 0$ , and solve for  $y$

### 2. INCREASING/DECREASING:

- Increasing when  $f'(x) > 0$ .
- Decreasing when  $f'(x) < 0$ .

### 3. RELATIVE MAX/MIN:

- Relative Max:  $f(c)$  is a relative max if  $f'(x)$  changes from  $+$  to  $-$  at  $x = c$ .
- Relative Min:  $f(c)$  is a relative min if  $f'(x)$  changes from  $-$  to  $+$  at  $x = c$ .

### 4. CONCAVITY:

- Concave up when  $f''(x) > 0$
- Concave down when  $f''(x) < 0$

### 5. POINTS OF INFLECTION: $P$ is a point of inflection if the concavity of $f$ changes at $P$ . (NOTE: To be a point of inflection $P$ must be *in the domain* of $f$ .)

### 6. SKETCH GRAPH

**Example 1.** Give a complete graph of

$$f(x) = x^3 - 9x^2 + 15x - 2.$$

Be sure to show on a sign chart where the function is increasing/decreasing, concave up/concave down, and identifying (as ordered pairs) all relative extrema and inflection points. Also, identify the  $y$ -intercept.

**Example 2.** Give a complete graph of

$$f(x) = x^4 + 8x^3 + 18x^2 + 8.$$

Be sure to show on a sign chart where the function is increasing/decreasing, concave up/concave down, and identifying (as ordered pairs) all relative extrema and inflection points. Also, identify the  $y$ -intercept.

**Example 3.** Give a complete graph of

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

Be sure to show on a sign chart where the function is increasing/decreasing, concave up/concave down, and identifying (as ordered pairs) all relative extrema and inflection points. Also, identify the  $y$ -intercept.