

Math Sheet

Name _____ Score _____ Teacher _____ Date _____

Concavity

Find the actual inflection coordinates and give the maximal open intervals where the polynomial is concave up and concave down.

1. Find actual inflection points; give concave-up/down intervals.

$$f(x) = 2 \cdot x^2 + 4$$

2. Find actual inflection points; give concave-up/down intervals.

$$f(x) = -2 \cdot x^3 - 12 \cdot x^2 - 18 \cdot x - 3$$

3. Find actual inflection points; give concave-up/down intervals.

$$f(x) = -2 \cdot x^4 - 8 \cdot x^3 + 16 \cdot x + 13$$

4. Find actual inflection points; give concave-up/down intervals.

$$f(x) = x^2 - 4 \cdot x$$

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Concavity

Find the actual inflection coordinates and give the maximal open intervals where the polynomial is concave up and concave down.

5. Find actual inflection points; give concave-up/down intervals.

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

6. Find actual inflection points; give concave-up/down intervals.

$$f(x) = -2 \cdot x^4 + 8 \cdot x^3 - 4 \cdot x^2 - 8 \cdot x + 3$$

7. Find actual inflection points; give concave-up/down intervals.

$$f(x) = -x^2 + 4 \cdot x - 1$$

8. Find actual inflection points; give concave-up/down intervals.

$$f(x) = -2 \cdot x^3 + 2$$

Concavity

Worked Answer Key

Find the actual inflection coordinates and give the maximal open intervals where the polynomial is concave up and concave down.

1. Differentiate and analyze signs.

f(x) = 2 · x² + 4

f'(x) = 4 · x

f''(x) = 4

f'' has no real zeros.

f'' signs: (-inf, +inf) +

No points.

Concave up: (-inf, +inf)

Concave down: none

2. Differentiate and analyze signs.

f(x) = - 2 · x³ - 12 · x² - 18 · x - 3

f'(x) = - 6 · x² - 24 · x - 18

f''(x) = - 12 · x - 24

Zeros: -2 (m1)

f'' signs: (-inf, -2) + (-2 , +inf) -

(-2 , 1) inflection point

Concave up: (-inf, -2)

Concave down: (-2 , +inf)

3. Differentiate and analyze signs.

f(x) = - 2 · x⁴ - 8 · x³ + 16 · x + 13

f'(x) = - 8 · x³ - 24 · x² + 16

f''(x) = - 24 · x² - 48 · x

Zeros: -2 (m1) 0 (m1)

f'' signs: (-inf, -2) - (-2 , 0) + (0, +inf) -

(-2 , 13) inflection point

(0, 13) inflection point

Concave up: (-2 , 0)

Concave down: (-inf, -2) (0, +inf)

4. Differentiate and analyze signs.

f(x) = x² - 4 · x

f'(x) = 2 · x - 4

f''(x) = 2

f'' has no real zeros.

f'' signs: (-inf, +inf) +

No points.

Concave up: (-inf, +inf)

Concave down: none

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Concavity

Worked Answer Key

Find the actual inflection coordinates and give the maximal open intervals where the polynomial is concave up and concave down.

5. Differentiate and analyze signs.

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

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

$$f''(x) = -6x$$

$$\text{Zeros: } 0 \text{ (m1)}$$

$$f'' \text{ signs: } (-\infty, 0) + (0, +\infty) -$$

$$(0, -1) \text{ inflection point}$$

$$\text{Concave up: } (-\infty, 0)$$

$$\text{Concave down: } (0, +\infty)$$

6. Differentiate and analyze signs.

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

$$f'(x) = -8x^3 + 24x^2 - 8x - 8$$

$$f''(x) = -24x^2 + 48x - 8$$

$$\text{Zeros: } -\frac{1}{3}\sqrt{6} + 1 \text{ (m1)} \quad \frac{1}{3}\sqrt{6} + 1 \text{ (m1)}$$

$$f'' \text{ signs: } (-\infty, -\frac{1}{3}\sqrt{6} + 1) - (-\frac{1}{3}\sqrt{6} + 1, \frac{1}{3}\sqrt{6} + 1) +$$

$$(\frac{1}{3}\sqrt{6} + 1, +\infty) -$$

$$(-\frac{1}{3}\sqrt{6} + 1, \frac{13}{9}) \text{ inflection point}$$

$$(\frac{1}{3}\sqrt{6} + 1, \frac{13}{9}) \text{ inflection point}$$

$$\text{Concave up: } (-\frac{1}{3}\sqrt{6} + 1, \frac{1}{3}\sqrt{6} + 1)$$

$$\text{Concave down: } (-\infty, -\frac{1}{3}\sqrt{6} + 1) \quad (\frac{1}{3}\sqrt{6} + 1, +\infty)$$

7. Differentiate and analyze signs.

$$f(x) = -x^2 + 4x - 1$$

$$f'(x) = -2x + 4$$

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

f'' has no real zeros.

$$f'' \text{ signs: } (-\infty, +\infty) -$$

No points.

$$\text{Concave up: none}$$

$$\text{Concave down: } (-\infty, +\infty)$$

8. Differentiate and analyze signs.

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

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

$$f''(x) = -12x$$

$$\text{Zeros: } 0 \text{ (m1)}$$

$$f'' \text{ signs: } (-\infty, 0) + (0, +\infty) -$$

$$(0, 2) \text{ inflection point}$$

$$\text{Concave up: } (-\infty, 0)$$

$$\text{Concave down: } (0, +\infty)$$