

Math 131**Supplementary problems #3 --- Curve Sketching**

Sketch each curve that satisfies the given conditions:

1. x -ints: $(-3, 0)$, $(-1, 0)$, y -int: $(0, 3)$, $f'(-2)=0$

$$f'(x) > 0 \text{ on } (-2, \infty),$$

$$f'(x) < 0 \text{ on } (-\infty, -2),$$

$$f''(x) > 0 \text{ for all real numbers.}$$

2. x -ints: $0, 4$, and -4 ,

$$f'(2) = f'(-2) = 0,$$

$$f'(x) > 0 \text{ on } (-2, 2),$$

$$f'(x) < 0 \text{ on } (-\infty, -2) \text{ and } (2, \infty),$$

$$f''(x) > 0 \text{ on } (-\infty, 0),$$

$$f''(x) < 0 \text{ on } (0, \infty).$$

3.

$$f(-2) = 1, f(0) = 2$$

$$f'(x) > 0 \text{ on } (-2, 0),$$

$$f'(x) < 0 \text{ on } (-\infty, -2) \text{ and } (0, \infty),$$

$$f''(x) > 0 \text{ on } (-\infty, -1) \text{ and } (1, \infty),$$

$$f''(x) < 0 \text{ on } (-1, 1),$$

$$\lim_{x \rightarrow \infty} f(x) = 0, \quad \lim_{x \rightarrow -\infty} f(x) = \infty$$

4. x -int: $(4, 0)$, y -ints: $(0, -1)$

$$f'(5) = 0, f(5) = -2,$$

$$\lim_{x \rightarrow \infty} f(x) = \lim_{x \rightarrow -\infty} f(x) = 0$$

$$\lim_{x \rightarrow 3^+} f(x) = \infty, \quad \lim_{x \rightarrow 3^-} f(x) = -\infty,$$

$$f'(x) > 0 \text{ on } (5, \infty),$$

$$f'(x) < 0 \text{ on } (-\infty, 3) \text{ and } (3, 5),$$

$$f''(x) > 0 \text{ on } (3, 6),$$

$$f''(x) < 0 \text{ on } (-\infty, 3) \text{ and } (6, \infty).$$

5. x -ints: -1 and 1

$$\lim_{x \rightarrow \infty} f(x) = \lim_{x \rightarrow -\infty} f(x) = 0, \quad \lim_{x \rightarrow 0} f(x) = -\infty,$$

$$\lim_{x \rightarrow -2^+} f(x) = \infty, \quad \lim_{x \rightarrow -2^-} f(x) = -\infty,$$

$$\lim_{x \rightarrow 2^+} f(x) = -\infty, \quad \lim_{x \rightarrow 2^-} f(x) = \infty,$$

$$f'(x) < 0 \text{ on } (-\infty, -2) \text{ and } (-2, 0),$$

$$f'(x) > 0 \text{ on } (0, 2) \text{ and } (2, \infty),$$

$$f''(x) > 0 \text{ on } (-2, -1) \text{ and } (1, 2),$$

$$f''(x) < 0 \text{ on } (-\infty, -2), (-1, 0), (0, 1), \text{ and } (2, \infty).$$

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The answers are not in a same order as the problems.

If you find any mistakes, please let me know. Thanks! li-chen2@neo.tamu.edu

