

No graphing calculators are allowed on this quiz. Please read each question carefully, follow directions and clearly mark your solutions. **Show your work for full credit.**

1. (4 pts) Find the interval(s) where the function is **increasing or decreasing** and **concave up or down**. Does the function have any relative minimum or relative maximum?

$$f(x) = x^4 - 4x^3$$

2. (4 pts) Does the following function have an inflection point?

$$2x + 1 + \frac{18}{x}$$

3. (2 pts) Sketch a function that has the following properties. Identify on your sketch inflection point(s) and relative extrema(s), if any.

- $f'(x) > 0$ when $x < 2$
- $f'(x) < 0$ when $x > 2$
- $f''(x) > 0$ when $x < -3$
- $f''(x) < 0$ when $-3 < x < 4$
- $f''(x) > 0$ when $x > 4$