Math 1300-005 - Spring 2017

Midterm 2 Review - 3/6/17

Guidelines: Please work in groups of two or three.

1. Let $f(x) = 2x^3 - 12x^2 + 3$. Please answer the following questions and remember to *fully justify your responses.*

   (a) Construct sign charts for f' and f''. The easiest way is to draw rough sketches of the graphs of f', which is a quadratic, and f'', is a line.

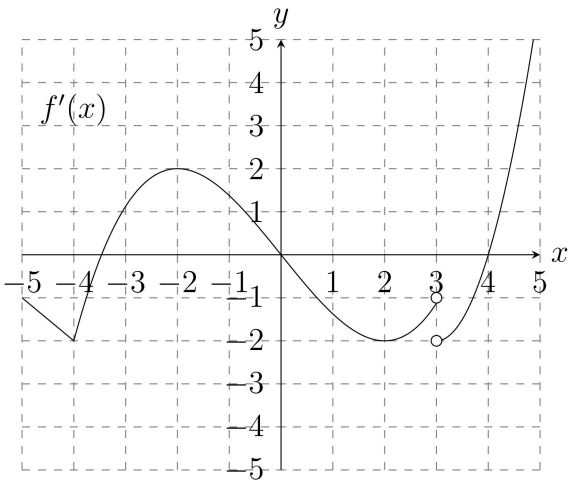
   (b) On what intervals is f increasing? On what interval is f decreasing?

   (c) On what intervals is f concave up? On what intervals is f concave down?

2. Find the point(s) a such that $y = 4x + 10$ is the tangent line to $f(x) = x^3 - 6x^2 - 11x + 2$ at $x = a$.

3. The graph below is the **derivative**, f', of some function f. Construct sign charts for f' and f'' in the space to the right of the graph.

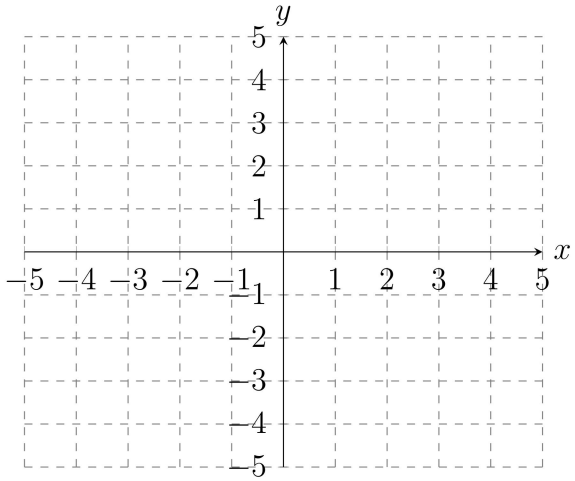
   Your sign chart for f' should include any points where $f' = 0$ as well as any points where f' DNE (like $x = 3$). Your sign chart for f'' should include any points where $f'' = 0$ as well as points where f'' DNE (corners and discontinuities on the graph of f').



   (a) On what intervals is f increasing? Decreasing? At values of x, if any, does f have a local maximum? A local minimum? Justify your answer.

   (b) On what intervals is f concave up? Concave down? At values of x, if any, does f have inflection points? Justify your answer.

   (c) Sketch a graph of $f''(x)$, which is the derivative of the graph shown above.

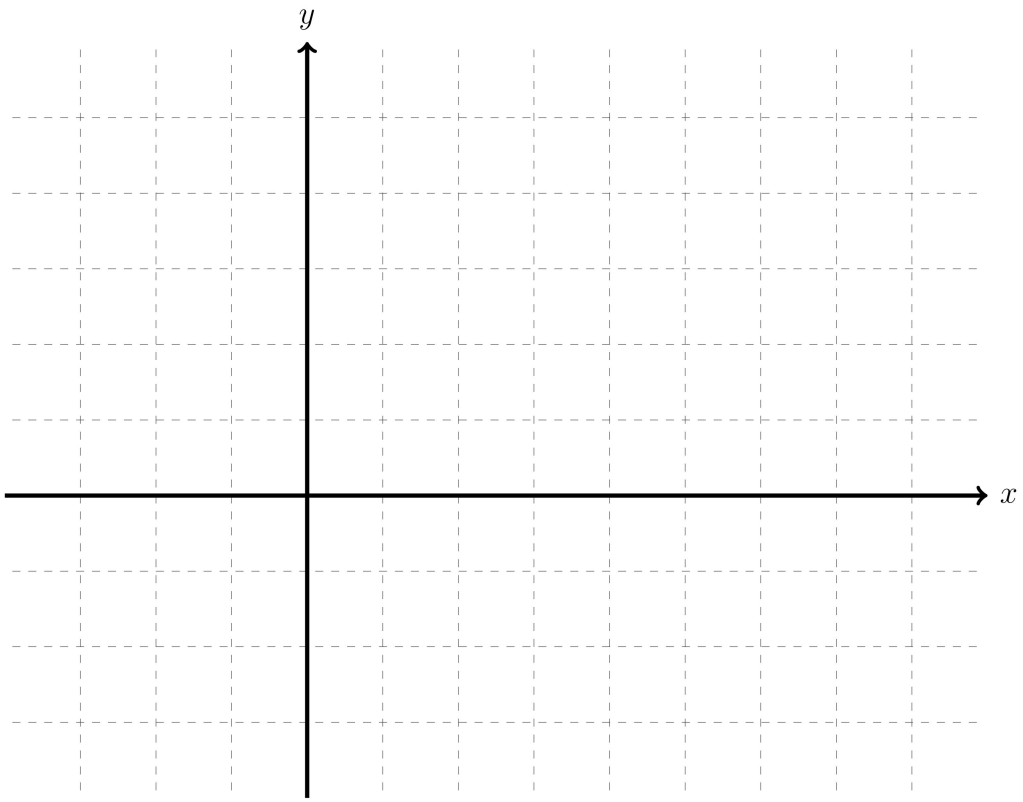


4. Consider the function f satisfying all of the following conditions.

- $f(x)$ is continuous on $(-\infty, \infty)$
- $f(-2) = f(6) = 0$
- $f(x) > 0$ on $(-2, 6)$ **and** $f(x) < 0$ on $(-\infty, -2) \cup (6, \infty)$
- $f'(0) = f'(2) = f'(4) = 0$
- $f'(x) > 0$ on $(-\infty, 0) \cup (2, 4)$ **and** $f'(x) < 0$ on $(0, 2) \cup (4, \infty)$
- $f''(1) = f''(3) = 0$
- $f''(x) > 0$ on $(1, 3)$ **and** $f''(x) < 0$ on $(-\infty, 1) \cup (3, \infty)$

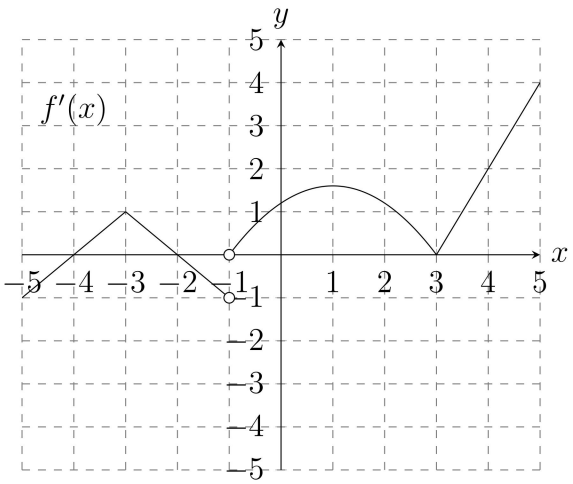
(a) Construct and label sign charts for f, f', and f'' based on the given information.

(b) Using your sign charts, sketch a graph of $y = f(x)$.



5. The graph below is the **derivative**, f', of some function f. Construct sign charts for f' and f'' in the space to the right of the graph.

   Your sign chart for f' should include any points where $f' = 0$ as well as any points where f' DNE (like $x = -1$). Your sign chart for f'' should include any points where $f'' = 0$ as well as points where f'' DNE (corners and discontinuities on the graph of f').



   (a) On what intervals is f increasing? Decreasing? At values of x, if any, does f have a local maximum? A local minimum? Justify your answer.

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