1. (12 points) This problem concerns the function $f(x) = 60x - 9x^2 - 2x^3$.

    (a) Find the critical points.

    (b) Find the intervals on which f increases and on which it decreases.

    (c) Use your answer from part (a) to identify the locations (x values) of any local extrema of f.
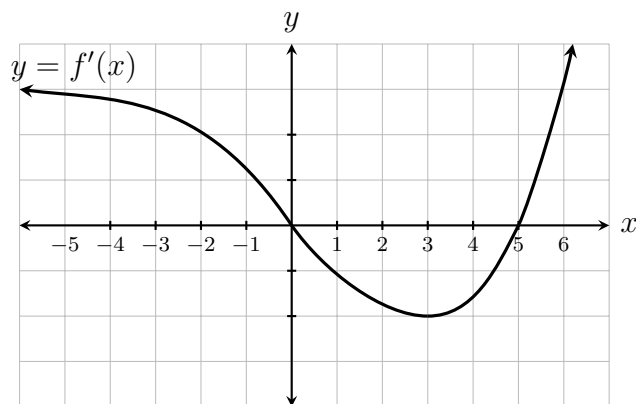
2. (8 points) The graph of the **derivative** $f'(x)$ of a function $f(x)$ is shown below.

    (a) State the critical points of f.

    (b) State the interval(s) on which f increases.

    (c) State the interval(s) on which f decreases.

    (d) Using the same coordinate axes, sketch a possible graph of $y = f(x)$.
        Be sure to clearly indicate any local extrema.

1. (12 points) This problem concerns the function $f(x) = x^2 e^x - 3e^x$.

   (a) Find the critical points.

   (b) Find the intervals on which f increases and on which it decreases.

   (c) Use your answer from part (a) to identify the locations (x values) of any local extrema of f.
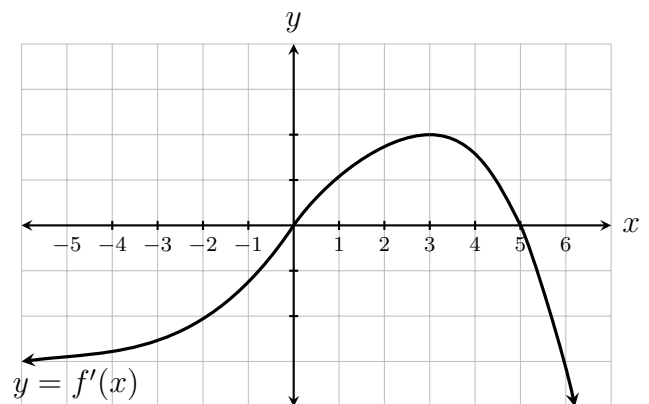
2. (8 points) The graph of the **derivative** $f'(x)$ of a function $f(x)$ is shown below.

   (a) State the critical points of f.

   (b) State the interval(s) on which f increases.

   (c) State the interval(s) on which f decreases.

   (d) Using the same coordinate axes, sketch a
       possible graph of $y = f(x)$.
       Be sure to clearly indicate any local extrema.

   $y = f'(x)$

1. (12 points) This problem concerns the function $f(x) = \ln(x^2 - 6x + 10)$.

   (a) Find the critical points.

   (b) Find the intervals on which f increases and on which it decreases.

   (c) Use your answer from part (a) to identify the locations (x values) of any local extrema of f.
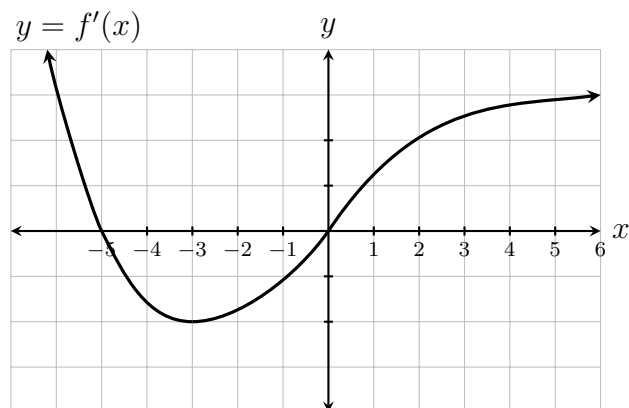
2. (8 points) The graph of the **derivative** $f'(x)$ of a function $f(x)$ is shown below.

   (a) State the critical points of f.

   (b) State the interval(s) on which f increases.

   (c) State the interval(s) on which f decreases.

   (d) Using the same coordinate axes, sketch a
       possible graph of $y = f(x)$.
       Be sure to clearly indicate any local extrema.

$y = f'(x)$ $\qquad y$

$-5 \quad -4 \quad -3 \quad -2 \quad -1 \qquad 1 \quad 2 \quad 3 \quad 4 \quad 5 \quad 6$ $\quad x$

1. (12 points) This problem concerns the function $f(x) = 3x^4 + 4x^3 - 2$.

   (a) Find the critical points.

   (b) Find the intervals on which f increases and on which it decreases.

   (c) Use your answer from part (a) to identify the locations (x values) of any local extrema of f.

2. (8 points) The graph of the **derivative** $f'(x)$ of a function $f(x)$ is shown below.

   (a) State the critical points of f.

   (b) State the interval(s) on which f increases.

   (c) State the interval(s) on which f decreases.

   (d) Using the same coordinate axes, sketch a
       possible graph of $y = f(x)$.
       Be sure to clearly indicate any local extrema.