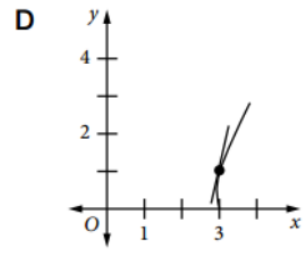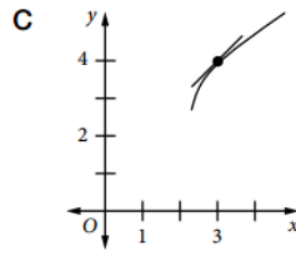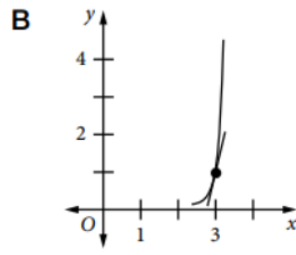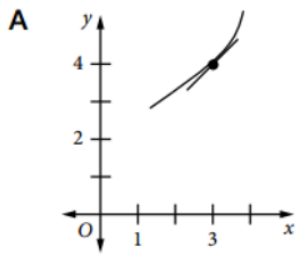# THE SIGN OF THE FIRST DERIVATIVE

1 A function $f(x)$ has the following properties: $f(3) = 4$, $f'(3) = 1$. Which sketches fit the graph of $y = f(x)$ near $x = 3$?

2 Sketch the graph of $y = f(x)$ with the following properties: $f(1) = 0$, $f'(x) = 2$ for all x. State the rule that defines the function.

3 Sketch the graph of a function given that $f(2) = 0$, $f'(2) = 0$, $f'(x) < 0$ for all $x < 2$, and $f'(x) > 0$ for all $x > 2$.

5 For the function $f(x) = x^2 - 5x + 6$, sketch the graph of $f'(x)$ and hence find the values of x for which:

(a) $f'(x) < 0$ (b) $f'(x) = 0$ (c) $f'(x) > 0$.

7 For the graph of $f(x) = 6 - 3x - x^2$, find the values of x for which the function:

(a) increases when x increases   **(b)** decreases when x increases

(c) changes from increasing to decreasing.

8 For the graph of $f(x) = x^3 - 6x^2 + 9x + 2$, find:

    (a) $f'(x)$

    (b) the values of x for which the function increases when x increases

    (c) the values of x for which the function decreases when x increases

    (d) the values of x for which the function changes from increasing to decreasing.

10 For the graph of $f(x) = (x - 1)^2(x + 1)$, find the values of x for which the function is:

    (a) stationary   **(b)** increasing   **(c)** decreasing.