

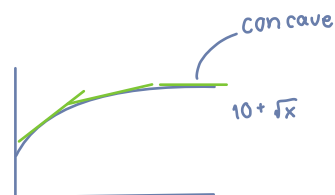
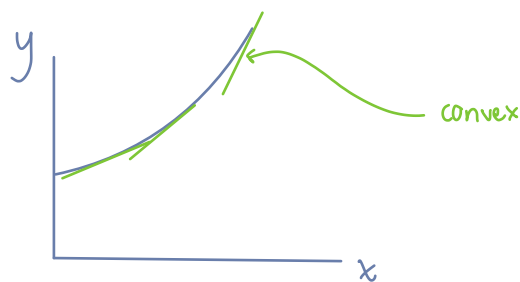
## Second-order Derivative: Slope of Slope

$$y = f(x) = 10 + x^2$$

$$f'(x) = 2x$$

$$f''(x) = 2$$

| Point | x | y  | f'(x) | f''(x) |
|-------|---|----|-------|--------|
|       | 0 | 10 | 0     |        |
| A     | 1 | 11 | 2     |        |
| B     | 2 | 14 | 4     |        |
| C     | 3 | 19 | 6     |        |



- The 2<sup>nd</sup>-order derivative indicates the curvature of the graph to be convex or concave.

HW Find the 2<sup>nd</sup>-order derivative of  $y = f(x) = 10 + \sqrt{x}$  and fill in the table:

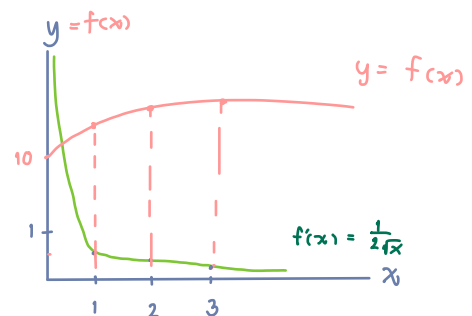
$$f'(x) = \frac{1}{2\sqrt{x}}$$

$$f''(x) = -\frac{1}{4\sqrt{x}^3}$$

$$\frac{1}{2} \cdot \left(-\frac{1}{2}\right) x^{-\frac{3}{2}}$$

$$-\frac{1}{4} \sqrt{x}^{-3/2}$$

| Point | x | y      | f'(x)    | f''(x)   |
|-------|---|--------|----------|----------|
|       | 0 | 10     | $\infty$ | $\infty$ |
| A     | 1 | 11     | 0.5      | -0.25    |
| B     | 2 | 11.414 | 0.35     | -0.088   |
| C     | 3 | 11.732 | 0.289    | -0.048   |



Plot the graph of  $y$  and  $f'(x)$ . Is  $f'(x)$  linear?

Ans  $f'(x)$  is not a linear