2.8 The Derivative as a Function

Notation: Given a function $f(x)$, the derivative of $f(x)$ is also a function, which is notated

$$f'(x) \text{ or } \frac{df}{dx} \text{ or } \frac{d}{dx} f(x)$$

Ex2.29) Calculate $f'(x)$ when $f(x) = \frac{1}{2+x}$.

Def'n: A function is differentiable at a point a if its derivative exists there. That is, $f(x)$ must be continuous at a and "smooth" at a.

Three situations make $f(x)$ non-differentiable at a point a.

1. A "corner".

2. A discontinuity.

3. A vertical tangent.

Ex2.30) What values of *m* and *b* make *f* differentiable everywhere?

$$f(x)=\begin{cases} x^2 & , \quad x \le 2 \\ mx+b & , \quad x > 2 \end{cases}$$

Notice that $f'(x) > 0$ whenever *f*(*x*) is rising to the right and $f'(x) < 0$ whenever *f*(*x*) is falling to the right.