

Find a tangent line at a point

1. Find the slope at the point

$$m = f'(a) = \lim_{x \rightarrow a} \frac{f(a) - f(x)}{a - x} = \lim_{h \rightarrow 0} \frac{f(a+h) - f(a)}{h}$$

2. Point slope form: $y - f(a) = m(x - a)$

3. Slope-intercept form: $y = mx + b$

Normal line: Perpendicular to tangent line.

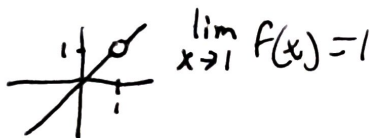
- The slope is the opposite reciprocal.

Ex: m of tangent = $\frac{3}{2}$ m of normal = $-\frac{2}{3}$

Limit properties:

- If $\lim_{x \rightarrow a^-} f(x) = \lim_{x \rightarrow a^+} f(x)$ then $\lim_{x \rightarrow a} f(x)$

- The function doesn't need to be defined at the point for the limit to exist



- The limit needs to be a finite number.

- $\infty / -\infty$ is DNE (Does not exist)

Infinite limits

$$\lim_{x \rightarrow a} f(x) = \pm \infty$$

- Vertical asymptote

- When denominator is 0

- $x = a$

Limits at infinity

$$\lim_{x \rightarrow \pm \infty} f(x) = L$$

- Horizontal asymptote

- $y = L$