Find a tangent line at a point

1. Find the slope at the point

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

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 reciprical.

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

Limit properties:

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

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

$\lim_{x \to 1} f(x) = 1$

- The limit needs to be a finite number.
  - $\infty / -\infty$ is DNE (Does not exist)

Infinite limits

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

- Verticle asymptote
- when denominator is 0
- $x = a$

Limits at infinity

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

- Horizontal asymptote
- $y = L$