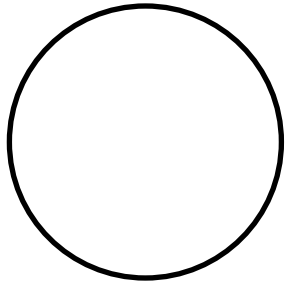
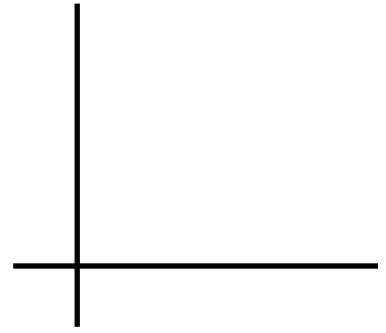
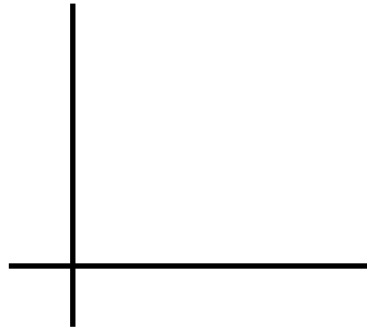


EQ:



secant line

tangent line



#### 14.7 Quotient Rule

EQ:

$$\frac{dy}{dx} \frac{f(x)}{g(x)} = \frac{g(x)f'(x) - f(x)g'(x)}{[g(x)]^2}$$

1.  $f(x) = \frac{x^2 - 1}{2x - 1}$

2.  $f(x) = \frac{3}{x^4}$

3.  $f(x) = \frac{4x^2}{x^{3/2}}$

Derivatives & Constants

$$\frac{dy}{dx} cf(x) = c \cdot \frac{dy}{dx} f(x)$$

4.  $f(x) = \frac{3\sqrt{x} - 2x}{5}$

5.  $f(x) = \frac{x^2 \cos x}{3 \sin x}$

## **I4.6 PRODUCT RULE / I4.7 QUOTIENT RULE**

# DERIVATIVES

## UNIT 14

EQ:

$$f(x) = x^n$$

$$f'(x) = nx^{n-1}$$

ex. Find  $f'(x)$  for the following functions

1.  $f(x) = 4x^2$

3.  $f(x) = 2\sqrt{x}$

2.  $f(x) = 3x^3 - 2x^2 + 7x$

4.  $f(x) = \frac{3}{x^2}$

5.  $\lim_{h \rightarrow 0} \frac{2(x+4)^4 - 2x^4}{h}$

6.  $\lim_{h \rightarrow 0} \frac{(2+h)^4 - 2^4}{h}$

---

## 14.4 THE POWER RULE

# 14.2 DEFINITION OF THE DERIVATIVE

---

Eq:

1.  $f(x) = 3x(x - 1)$

Find the slope of the tangent line when  $x = 2$

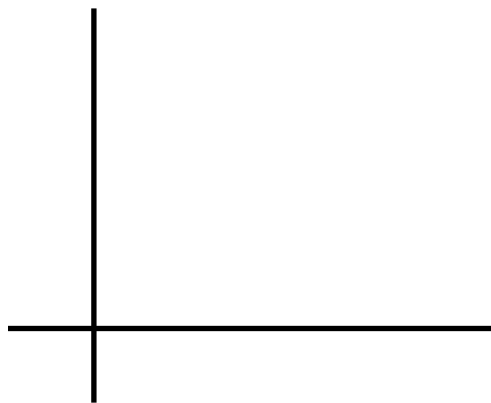
Write the equation of the tangent line when  $x = 2$

ex.  $f(x) = 5x^2$ , find  $f'(x)$  and  $f'(3)$

EQ:

tangent line

$$\lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$$



Notations:

2. Find all vertical tangents for  $f(x) = \sqrt{x+2}$

3. Does the curve have a tangent at  $x = 2$ ?

$$f(x) = \begin{cases} x^2 - 2x & x \leq 2 \\ 3x - 4 & x > 2 \end{cases}$$

---

## 14.5 EQUATIONS OF TANGENT LINES

# 14.1 SECANT/TANGENT LINES

$$\frac{dy}{dx} \sin x = \cos x$$

$$\frac{dy}{dx} \cos x = -\sin x$$

$$\frac{d}{dx} f(x)g(x) = f'(x)g(x) + f(x)g'(x)$$

$$1. f(x) = (3x - 2)(x^2 + 2) \quad 2. f(x) = (x^2 - x + 3)(7x^2 - 2x + 4)$$

$$3. f(x) = 4x \cos x \quad 4. f(x) = 4 \cos x$$

$$5. \text{ Find } f'(x), f''(x), \text{ and } f'''(x) \text{ if } f(x) = \sin x$$

ex.

t	f(t)
1	7
2	12
3	16
4	21
5	26

1. Find average rate of change  $1 \leq t \leq 3$
2. Estimate the velocity at  $t = 3.5$
3. Find the velocity at  $t = 1$

Ex. Find the average velocity for  $f(x) = x^2 - 3x + 6$  on  $[x, x+h]$