Section 2.3 - Derivatives of a Polynomial & e^x

$\frac{d}{dx} A = 0$ $\frac{d}{dx} x = 1$ $\frac{d}{dx} x^n = n x^{n-1}$

(Power Rule)

$\frac{d}{dx} K f(x) = K \left(\frac{d}{dx} f(x)\right)$

(constant multiple Rule)

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

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

(sum / difference Rule)

$\frac{d}{dx} e^x = e^x$

Examples:

-Take the derivative of the function

- $f(x) = 5x - \pi$ $f'(x) = 5$
- $f(x) = 4x^4 + 2x^2 - 2$ $f'(x) = 16x^3 + 4x$
- $f(u) = 9u^3 - 2u^2 + 4u + 4$ $f'(u) = 18u^2 - 4u + 4$
- $f(s) = 4 - \pi s^2$ $f'(s) = -2\pi s$
- $f(x) = \frac{1}{3}(x^7 - 3x^2 + 2)$ $f'(x) = \frac{1}{3}(7x^6 - 6x)$
- $f(x) = \frac{x^7 - 5x}{9}$ $f'(x) = \frac{1}{9}(7x^6 - 5)$
- $f(x) = \frac{1}{a}(ax^2 + bx + c)$ $f'(x) = \frac{1}{a}(2ax + b)$
- $f(x) = ax^3 + bx^2 + cx + d$ $f'(x) = 3ax^2 + 2bx + c$
- $f(x) = -\frac{1}{2} e^x$ $f'(x) = \frac{-1}{2} e^x$
- $f(u) = 3e^u + 10$ $f'(u) = 3e^u$
- $\frac{d}{dt}\left(\frac{2t^4 - 5}{8}\right)$ $f'(t) = t^3$
- $\frac{dc}{dR}$ if $C = 2\pi R$ $\frac{dc}{dR} = 2\pi$

→ $f(x) = x^2+4x-3$

- where are the horizontal tangent lines?

$f'(x) = 2x+4$ @ $x=-2$

$2(x+2)$

- eq of the horizontal tangent line?

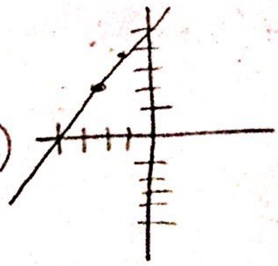
$f(-2) = (-2)^2+4(-2)-3 = -7$ $y=-7$

$4-8-3$

- where is $f'(x) > 0$?

$f'(x) = 2x+4$

$f'(x) > 0 \rightarrow (-\infty, -2)$



- where is $f'(x) < 0$?

$(-2, \infty)$