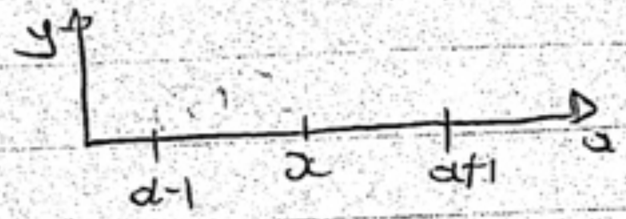
Excercise 4 : MFKZIZOO4

Sketch



(a) $f(x) = \frac{x}{x+1}$

note: numerator → a x
denominator → b ... $(x+1)$

for first derivation : below what we'll use to differentiate.
$a'(x) = 1$ and $b'(x) = 1$

$$f'x = \frac{b \cdot (1) - a \cdot (1)}{(x+1)^2}$$

$$= \frac{\cancel{x}+1 \cancel{- x}}{(x+1)^2}$$

∴ first derivative : $f'(x) = \frac{1}{(x+1)^2}$

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

we'll need to use $f'(x) = \frac{1}{(x+1)^2}$

∴ $f'(x) = (x+1)^{-2}$ Since it has exponent
we'll use $f(x) = g(x)^n$.
* This helps get $f''(x)$.

$$f''(x) = n[g(x)]^{n-1} \cdot g'(x)$$
$$= -2[x+1]^{-2-1} \cdot (1)$$
$$= -2(x+1)^{-3}$$

∴ $f''(x) = -2(x+1)^{-3} \approx -2 \cdot \frac{1}{(x+1)^3} \approx \frac{-2}{(x+1)^3}$

(3) $f(x) = \ln x^2$

$f'(x) = 2 \cdot \ln(x_0)$

$$f''(x) = 2\ln(x_0) + \frac{2}{x_0}(x - x_0) - \frac{1}{x_0^2}(x - x_0)^2$$