6.4 # 31 $\qquad \mathcal{D}$ & f'

$$f(x) = \frac{x}{1-\ln(x-1)}$$

$\mathcal{D}$: Need $1-\ln(x-1) \neq 0$

and $x-1>0$

$\ln(x-1)-1=0$

$\ln(x-1)=1$

$x-1=e^1$

$\boxed{x=1+e}$

$\notin \mathcal{D}$

$(1+e, \infty)$

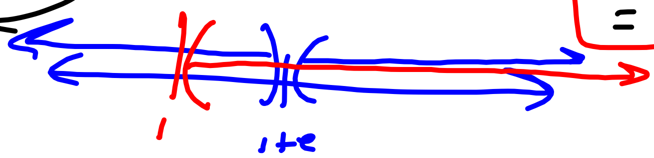
$\ln(x^2+1) - \ln(x-1)$

Need $x-1>0$

$\ln(x+2) - \ln(x+1)$ $\mathcal{D}=(-1,\infty)$

$= \ln\left(\frac{x+2}{x-1}\right)$ $\mathcal{D}=(-\infty,-2) \cup (-1,\infty)$

AND



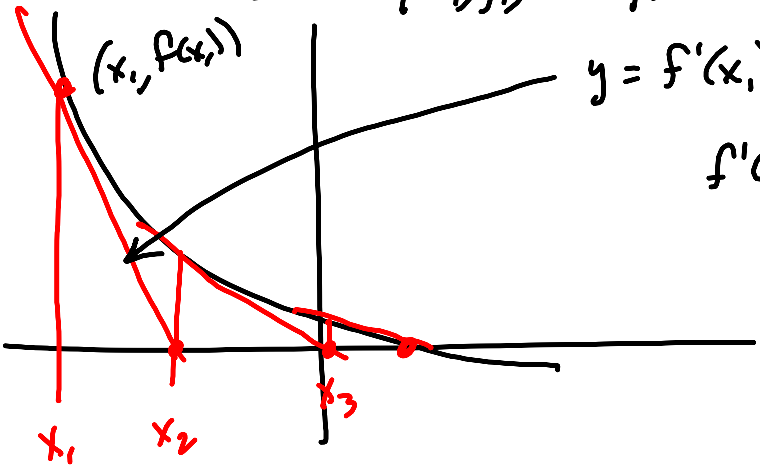
Also need $x-1>0$

$x>1$

$\Rightarrow \mathcal{D} = (1, 1+e) \cup (1+e, \infty)$

Given m & (x_1, y_1)

$y = m(x - x_1) + y_1$



$y = f'(x_1)(x - x_1) + f(x_1) \stackrel{SET}{=} 0$

$f'(x_1)(x - x_1) = -f(x_1)$

$x - x_1 = \frac{-f(x_1)}{f'(x_1)}$

$x = x_1 - \frac{f(x_1)}{f'(x_1)} = x_2$

$x_2 = x_1 - \frac{f(x_1)}{f'(x_1)}$

$\vdots$

$$\boxed{x_{n+1} = x_n - \frac{f(x_n)}{f'(x_n)}}$$

$$y = \sqrt{x}\; e^{x^2-x}\,(x+1)^{\frac{2}{3}}$$

$$\ln\left(\frac{A^b C^d}{E^f}\right) = b\ln A + d\ln C - f\ln E$$

$$\ln(y) = \ln\Big(\qquad \Big)$$

$$= \frac{1}{2}\ln(x) + x^2-x + \frac{2}{3}\ln(x+1)$$

$$\ln\left(e^{x^2-x}\right) = (x^2-x)\ln(e) = x^2-x$$

$$\log(A^B) = B\log(A)$$

$$\log\left(\frac{A}{B}\right) = \log A - \log B$$

$$\frac{y'}{y} = \frac{1}{2}\left(\frac{1}{x}\right) + 2x-1 + \frac{2}{3}\left(\frac{1}{x+1}\right)$$

$$y' = \left[\frac{1}{2x} + 2x-1 + \frac{2}{3(x+1)}\right]\sqrt{x}\; e^{x^2-x}\,(x+1)^{\frac{2}{3}}$$

Compound Interest:

Simple Interest

$A = P + Prt = P(1+rt)$

Compound interest

$m =$ # of periods per year

$r =$ rate

$t =$ time

$n = mt =$ # of periods total

$A =$ future value

$P =$ Present value

$i = \frac{r}{m} =$ rate per period.

Period	A
1	$P + Pi$
2	$P + Pi + (P+Pi)i$
	$= (P+Pi)(1+i)$
	$= P(1+i)(1+i) = P(1+i)^2$
3	$P(1+i)^2 + P(1+i)^2 i = P(1+i)^3$
$\vdots$	
n	$A = P(1+i)^n = P\left(1+\frac{r}{m}\right)^{mt}$

FACT Compounded Daily is close to compounded continuously:

$$= \lim_{m\to\infty} P\left(1+\frac{r}{m}\right)^{mt}$$

$$a^{bc} = (a^b)^c \qquad (3^2)^7 = 3^{14}$$

$$P\left(1+\frac{r}{m}\right)^{mt} = P\left(1+\frac{1}{\frac{m}{r}}\right)^{\frac{m}{r}\cdot rt}$$

$$= P\left(\left(1+\frac{1}{\frac{m}{r}}\right)^{\frac{m}{r}}\right)^{rt}$$

$$= P\left(\left(1+\frac{1}{u}\right)^{u}\right)^{rt} \xrightarrow[\text{(i.e. } \frac{m}{r}\to\infty)]{u\to\infty} P(e)^{rt} = Pe^{rt}$$

Note

FROM BOOK

$$\boxed{e = \lim_{x\to\infty}\left(1+\frac{1}{x}\right)^x = \lim_{t\to 0}(1+t)^{\frac{1}{t}}}$$