Shihab Muhtasim

Student ID: 21301610

MAT 110

ASSIGNMENT 01

SET 15

Ans to the question no 01

f(x) will be continuous at x=0 if left hand limit = right hand limit,$\lim_{x\to 0} f(x) = f(0)$ and f(0) is defined.

Now, L.H.L=$\lim_{x\to 0^-} f(x) = \lim_{x\to 0^-} x + 2 = 0 + 2 = 0$

R.H.L=$\lim_{x\to 0^+} f(x) = \lim_{x\to 0^+} x^2 - 1 = 0 - 1 = -1$

$\therefore L.H.L \neq R.H.L$

Hence, the first condition of continuity is not fulfilled. f(x) is not continuous at x=0

Ans to the question no 02

$\lim_{x\to 1} f(x)$ will exist if left hand limit = right hand limit, $\lim_{x\to 1} f(x) = f(1)$ and f(1) is defined.

Now, L.H.L=$\lim_{x\to 1^-} f(x) = \lim_{x\to 1^-} x + 5 = 1 + 5 = 6$

R.H.L=$\lim_{x\to 0^+} f(x) = \lim_{x\to 0^+} x^3 - 4x = 1 - 4 = -3$

$\therefore L.H.L \neq R.H.L$

Hence, $\lim_{x\to 1} f(x)$ does not exist

Ans to the question no 03

Evaluating,

$$\frac{d^2}{dx^2}(\ln(\frac{x^4+2x^3}{x^2+1}))$$

$$\Rightarrow \frac{d}{dx}(\frac{d}{dx}(\ln(\frac{x^4+2x^3}{x^2+1}))$$

$$\Rightarrow \frac{d}{dx}[(\frac{x^2+1}{x^4+2x^3}) \cdot \frac{d}{dx}(\frac{x^4+2x^3}{x^2+1})]$$

$$\Rightarrow \frac{d}{dx}[(\frac{x^2+1}{x^4+2x^3}) \cdot \frac{(x^2+1)\frac{d}{dx}(x^4+2x^3)-(x^4+2x^3)\frac{d}{dx}(x^2+1)}{(x^2+1)^2}]$$

$$\Rightarrow \frac{d}{dx}[(\frac{x^2+1}{x^4+2x^3}) \cdot \frac{(x^2+1)(4x^3+6x^2)-(x^4+2x^3)(2x)}{(x^2+1)^2}]$$

$$\Rightarrow \frac{d}{dx}[\frac{(x^2+1)(4x^3+6x^2)-2x(x^4.+2x^3)}{(x^4+2x^3)(x^2+1)}]$$

$$\Rightarrow \frac{d}{dx}[\frac{4x^3+6x^2}{x^4+2x^3} - \frac{2x}{x^2+1}]$$

$$\Rightarrow \frac{d}{dx}[\frac{4x+6}{x^2+2x} - \frac{2x}{x^2+1}]$$

$$\Rightarrow \frac{d}{dx}(\frac{4x+6}{x^2+2x}) - \frac{d}{dx}(\frac{2x}{x^2+1})$$

$$\Rightarrow \frac{(x^2+2x)\frac{d}{dx}(4x+6)-(4x+6)\frac{d}{dx}(x^2+2x)}{(x^2+2x)^2} - \frac{(x^2+1)\frac{d}{dx}(2x)-(2x)\frac{d}{dx}(x^2+1)}{(x^2+1)^2}$$

$$\Rightarrow \frac{(x^2+2x)\cdot 4-(4x+6)\cdot(2x+2)}{(x^2+2x)^2} - \frac{(x^2+1)\cdot 2-2x\cdot(2x))}{(x^2+1)^2}$$

$$\Rightarrow \frac{4x^2+8x-8x^2-20x-12}{(x^2+2x)^2} - \frac{2x^2+2-4x^2}{(x^2+1)^2}$$

$$\Rightarrow -\frac{4x^2+12x+12}{(x^2+2x)^2} + \frac{2x^2-2}{(x^2+1)^2}$$

$$\Rightarrow \frac{2x^2-2}{(x^2+1)^2} - \frac{4x^2+12x+12}{(x^2+2x)^2}$$

$$\Rightarrow \frac{(2x^2-2)(x^2+2x)^2-(4x^2+12x+12)(x^2+1)^2}{(x^2+1)^2(x^2+2x)^2}$$

$$\Rightarrow \frac{(2x^2-2)(x^4+4x^3+4x^2)-(4x^2+12x+12)(x^4+2x^2+1)}{x^2(x^2+1)^2(x+2)^2}$$

$$\Rightarrow \frac{2x^6+8x^5+8x^4-2x^4-8x^3-8x^2-4x^6-12x^5-12x^4-8x^4-24x^3-24x^2-4x^2-12x-12}{x^2(x^2+1)^2(x+2)^2}$$

$$\Rightarrow \frac{-2x^6-4x^5-14x^4-32x^3-36x^2-12x-12}{x^2(x^2+1)^2(x+2)^2}$$

Ans to the question no 04

Given,$(x-y)^2 = x+y-1$

$\Rightarrow x^2 - 2xy + y^2 = x + y - 1$

$\Rightarrow \frac{d}{dx}(x^2 - 2xy + y^2) = \frac{d}{dx}(x + y - 1)$

$\Rightarrow 2x - 2y + 2y\frac{dy}{dx} - 2x\frac{dy}{dx} = 1 + \frac{dy}{dx} - 0$

$\Rightarrow 2y\frac{dy}{dx} - 2x\frac{dy}{dx} - \frac{dy}{dx} = 1 - 2x + 2y$

$\Rightarrow \frac{d}{dx}(2y - 2x - 1) = 2y - 2x + 1$

$\Rightarrow \frac{d}{dx} = \frac{2y-2x+1}{2y-2x-1}$

$\therefore \frac{d}{dx} = \frac{2y-2x+1}{2y-2x-1}$

Ans to the question no 05

We have to evaluate,

$\frac{d}{dx}(\sin^2 \frac{(2x)}{(x+1)})$

Let,

$a = \frac{2x}{x+1}$
$\Rightarrow a = 2x(x+1)^-1$
$\Rightarrow \frac{d}{dx}a = \frac{d}{dx}2x(x+1)^-1$
$\Rightarrow \frac{d}{dx}(a) = 2(x+1)^-1 + 2x(-1)(x+1)^-2$
$\Rightarrow \frac{d}{dx}a = \frac{2}{x+1} - \frac{2x}{(x+1)^2}$
$\Rightarrow \frac{d}{dx}a = \frac{2(x+1)-2x}{(x+1)^2}$
$\Rightarrow \frac{d}{dx}a = \frac{2x+2-2x}{(x+1)^2}$
$\Rightarrow \frac{d}{dx}a = \frac{2}{(x+1)^2}$

Evaluating,

$\frac{d}{dx}(\sin^2 \frac{(2x)}{(x+1)})$
$= \frac{d}{dx}(\sin^2 a)$
$= 2\sin a \cos a \frac{d}{dx}a$
$= \sin 2a \frac{d}{dx}a$
$= \sin(\frac{2 \cdot 2x}{x+1}) \cdot \frac{2}{(x+1)^2}$
$= \frac{2\sin(\frac{4x}{x+1})}{(x+1)^2}$
We get, $\frac{d}{dx}(\sin^2 \frac{(2x)}{(x+1)}) = \frac{2\sin(\frac{4x}{x+1})}{(x+1)^2}$

Ans to the question no 06 (a)

Given,

$P(t) = \frac{M}{1+Ae^-kt}$

$\lim_{t\to\infty} P(t) = \lim_{t\to\infty} \frac{M}{1+Ae^-kt}$

$\Rightarrow \lim_{t\to\infty} P(t) = \lim_{t\to\infty} \frac{M}{1+\frac{A}{e^kt}}$

$\Rightarrow \lim_{t\to\infty} P(t) = \frac{M}{1+\frac{A}{e^k\infty}}$

$\Rightarrow \lim_{t\to\infty} P(t) = \frac{M}{1+\frac{A}{\infty}}$

$\Rightarrow \lim_{t\to\infty} P(t) = \frac{M}{1} \Rightarrow \lim_{t\to\infty} P(t) = M$

The answer M refers to the maximum population size that can be carried and when t tends to infinity it means that the carrying capacity becomes the maximum population size that can be supported. That's why the answer M is to be expected

Ans to the question no 06 (b)

Given,

$P(t) = \frac{M}{1+Ae^-kt}$

$\lim_{M\to\infty} P(t) = \lim_{M\to\infty} \frac{M}{1+Ae^-kt}$

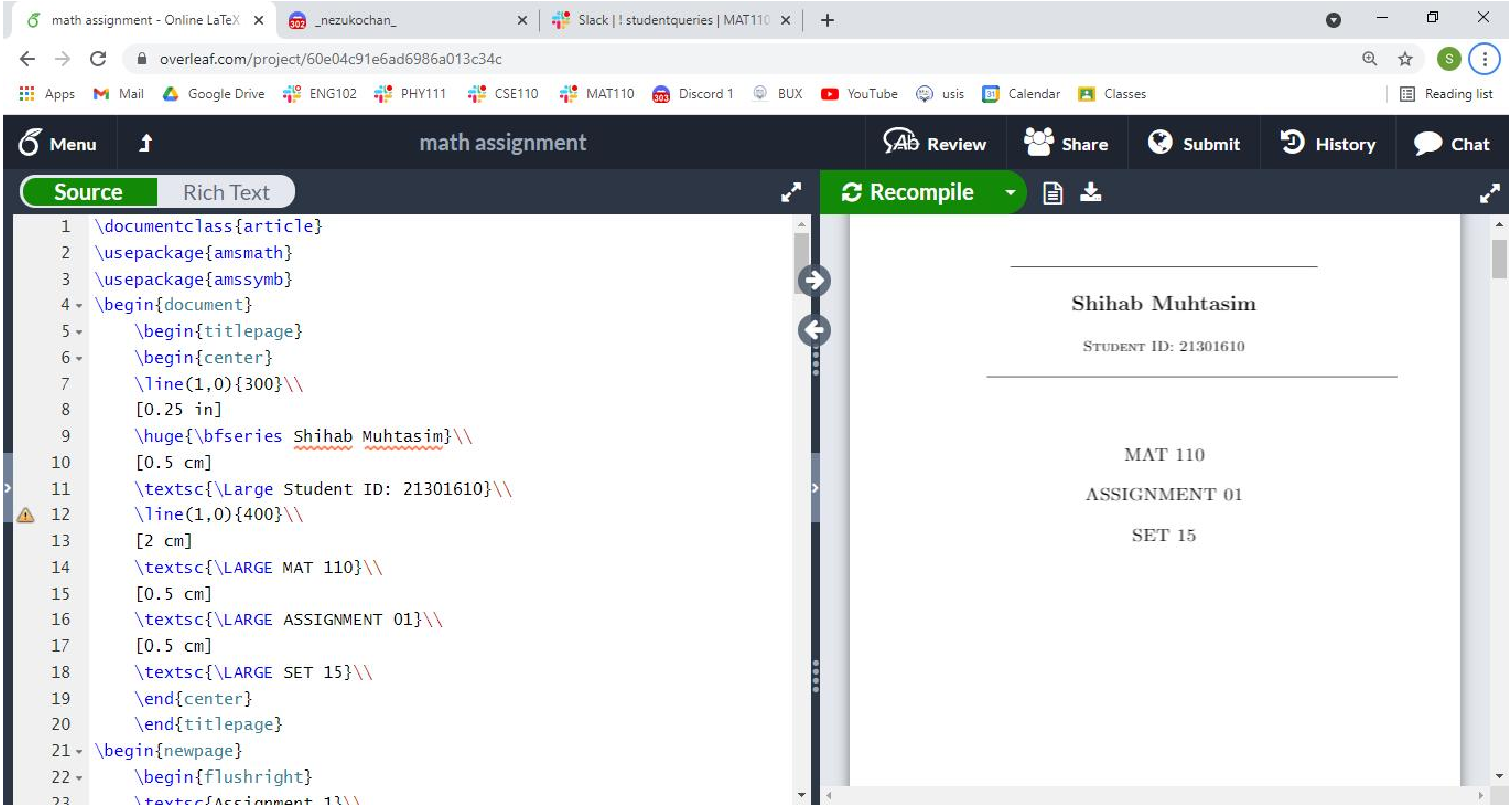
$\Rightarrow \lim_{M\to\infty} P(t) = \lim_{t\to\infty} \frac{M}{1+(\frac{M-P_o}{P_o})e^-kt}$

$\Rightarrow \lim_{M\to\infty} P(t) = \lim_{M\to\infty} \frac{MP_o}{P_o(1-e^-kt)+Me^-kt}$

$\Rightarrow \lim_{M\to\infty} P(t) = \lim_{M\to\infty} \frac{P_o}{e^-kt}$

$\Rightarrow \lim_{M\to\infty} P(t) = P_o e^{kt}$

The result is $P_o e^{kt}$ which is an exponential function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\usepackage{amssymb}
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\huge{\bfseries Shihab Muhtasim}\\
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\textsc{\Large Student ID: 21301610}\\
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\textsc{\LARGE MAT 110}\\
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\textsc{\LARGE ASSIGNMENT 01}\\
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Student ID: 21301610
MAT 110
ASSIGNMENT 01
SET 15

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    \huge{\bfseries Shihab Muhtasim}\\
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    \textsc{\Large Student ID: 21301610}\\
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    \textsc{\LARGE MAT 110}\\
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    \textsc{\LARGE ASSIGNMENT 01}\\
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    \textsc{\LARGE SET 15}\\
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    \textsc{Problem 1}\\
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  \textbf{\Large \underline {Ans to the question no 01}}\\
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\end{center}
\Large {f(x) will be continuous at x=0 if left hand limit = right hand limit,$\lim_{x \to 0}f(x)=f(0)$ and f(0) is defined.\\[0.5cm]
Now, L.H.L=$\lim_{x \to 0^-}f(x)=\lim_{x \to 0^-}x+2=0+2=0$\\[3mm]
R.H.L=$\lim_{x \to 0^+}f(x)=\lim_{x \to 0^+}x^2-1=0-1=-1$\\[3mm]
$\therefore L.H.L \neq R.H.L$\\[3mm]
Hence, the first condition of continuity is not fulfilled. f(x) is not continuous at x=0 }
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ASSIGNMENT 1
PROBLEM 1

<u>Ans to the question no 01</u>

f(x) will be continuous at x=0 if left hand limit = right hand limit,$\lim_{x \to 0} f(x) = f(0)$ and f(0) is defined.

Now, L.H.L=$\lim_{x \to 0^-} f(x) = \lim_{x \to 0^-} x+2 = 0+2 = 0$

R.H.L=$\lim_{x \to 0^+} f(x) = \lim_{x \to 0^+} x^2-1 = 0-1 = -1$

$\therefore L.H.L \neq R.H.L$

Hence, the first condition of continuity is not fulfilled. f(x) is not continuous at x=0

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Hence, the first condition of continuity is not fulfilled. f(x) is
not continuous at x=0 }
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    \textsc{Assignment 1}\\
    \textsc{Problem 2}\\
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\begin{center}
  \textbf{\Large \underline {Ans to the question no 02}}\\
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\Large {$\lim_{x \to 1}f(x)$ will exist if left hand limit = right
hand limit, $\lim_{x \to 1}f(x)=f(1)$ and f(1) is defined.\\[0.5cm]}
Now, L.H.L=$\lim_{x \to 1^-}f(x)=\lim_{x \to 1^-}x+5=1+5=6$\\[3mm]
R.H.L=$\lim_{x \to 0^+}f(x)=\lim_{x \to 0^+}x^3-4x=1-4=-3$\\[3mm]
$\therefore L.H.L \neq R.H.L$\\[3mm]
Hence, {$\lim_{x \to 1}f(x)$ does not exist }
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    \textsc{Assignment 1}\\
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ASSIGNMENT 1
PROBLEM 2

Ans to the question no 02

$\lim_{x\to 1} f(x)$ will exist if left hand limit = right hand limit, $\lim_{x\to 1} f(x) = f(1)$ and f(1) is defined.

Now, L.H.L=$\lim_{x\to 1^-} f(x) = \lim_{x\to 1^-} x+5 = 1+5 = 6$

R.H.L=$\lim_{x\to 0^+} f(x) = \lim_{x\to 0^+} x^3 - 4x = 1-4 = -3$

$\therefore L.H.L \neq R.H.L$

Hence, $\lim_{x\to 1} f(x)$ does not exist

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Hence, {$\lim_{x \to 1}f(x)$ does not exist }
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    \textsc{Assignment 1}\\
    \textsc{Problem 3}\\
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\begin{center}
  \textbf{\Large \underline {Ans to the question no 03}}\\
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\Large {Evaluating,}\\[2mm]
\LARGE {$\frac{d^2}{dx^2}(\ln{(\frac{x^4+2x^3}{x^2+1})})\\[3mm]
\Rightarrow \frac{d}{dx}(\frac{d}{dx}(\ln(\frac{x^4+2x^3}{x^2+1}))\\[3mm]
\Rightarrow \frac{d}{dx}[(\frac{x^2+1}{x^4+2x^3})\cdot\frac{d}{dx}(\frac{x^4+2x^3}{x^2+1})
]\\[3mm]
\Rightarrow \frac{d}{dx}[(\frac{x^2+1}{x^4+2x^3})\cdot\frac{(x^2+1)\frac{d}{dx}(x^4+2x^3)-
(x^4+2x^3)\frac{d}{dx}(x^2+1)}{(x^2+1)^2}]\\[3mm]
\Rightarrow \frac{d}{dx}[(\frac{x^2+1}{x^4+2x^3})\cdot\frac{(x^2+1)(4x^3+6x^2)-(x^4+2x^3)(
2x)}{(x^2+1)^2}]\\[3mm]
\Rightarrow \frac{d}{dx}[\frac{(x^2+1)(4x^3+6x^2)-2x(x^4.+2x^3)}{(x^4+2x^3)(x^2+1)}]\\[3mm
]
\Rightarrow \frac{d}{dx}[\frac{4x^3+6x^2}{x^4+2x^3}-\frac{2x}{x^2+1}]\\[3mm]
\Rightarrow \frac{d}{dx}[\frac{4x+6}{x^2+2x}-\frac{2x}{x^2+1}]\\[3mm]
\Rightarrow \frac{d}{dx}(\frac{4x+6}{x^2+2x})-\frac{d}{dx}(\frac{2x}{x^2+1})\\[3mm]
\Rightarrow \frac{(x^2+2x)\frac{d}{dx}(4x+6)-(4x+6)\frac{d}{dx}(x^2+2x)}{(x^2+2x)^2}-\frac
{(x^2+1)\frac{d}{dx}(2x)-(2x)\frac{d}{dx}(x^2+1)}{(x^2+1)^2}\\[3mm]
\Rightarrow \frac{(x^2+2x)\cdot4-(4x+6)\cdot(2x+2)}{(x^2+2x)^2}-\frac{(x^2+1)\cdot2-2x\cdo
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Ans to the question no 03

Evaluating,

$\frac{d^2}{dx^2}(\ln{(\frac{x^4+2x^3}{x^2+1})})$

$\Rightarrow \frac{d}{dx}(\frac{d}{dx}(\ln(\frac{x^4+2x^3}{x^2+1}))$

$\Rightarrow \frac{d}{dx}[(\frac{x^2+1}{x^4+2x^3})\cdot\frac{d}{dx}(\frac{x^4+2x^3}{x^2+1})]$

$\Rightarrow \frac{d}{dx}[(\frac{x^2+1}{x^4+2x^3})\cdot\frac{(x^2+1)\frac{d}{dx}(x^4+2x^3)-(x^4+2x^3)\frac{d}{dx}(x^2+1)}{(x^2+1)^2}]$

$\Rightarrow \frac{d}{dx}[(\frac{x^2+1}{x^4+2x^3})\cdot\frac{(x^2+1)(4x^3+6x^2)-(x^4+2x^3)(2x)}{(x^2+1)^2}]$

$\Rightarrow \frac{d}{dx}[\frac{(x^2+1)(4x^3+6x^2)-2x(x^4.+2x^3)}{(x^4+2x^3)(x^2+1)}]$

$\Rightarrow \frac{d}{dx}[\frac{4x^3+6x^2}{x^4+2x^3}-\frac{2x}{x^2+1}]$

$\Rightarrow \frac{d}{dx}[\frac{4x+6}{x^2+2x}-\frac{2x}{x^2+1}]$

$\Rightarrow \frac{d}{dx}(\frac{4x+6}{x^2+2x})-\frac{d}{dx}(\frac{2x}{x^2+1})$

$\Rightarrow \frac{(x^2+2x)\frac{d}{dx}(4x+6)-(4x+6)\frac{d}{dx}(x^2+2x)}{(x^2+2x)^2}-\frac{(x^2+1)\frac{d}{dx}(2x)-(2x)\frac{d}{dx}(x^2+1)}{(x^2+1)^2}$

$\Rightarrow \frac{(x^2+2x)\cdot4-(4x+6)\cdot(2x+2)}{(x^2+2x)^2}-\frac{(x^2+1)\cdot2-2x\cdot(2x))}{(x^2+1)^2}$

$\Rightarrow \frac{4x^2+8x-8x^2-20x-12}{(x^2+2x)^2}-\frac{2x^2+2-4x^2}{(x^2+1)^2}$

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)}]\\[3mm]
\Rightarrow \frac{d}{dx}[\frac{4x^3+6x^2}{x^4+2x^3}-\frac{2x}{x^2+1}]\\[3mm]
\Rightarrow \frac{d}{dx}[\frac{4x+6}{x^2+2x}-\frac{2x}{x^2+1}]\\[3mm]
\Rightarrow \frac{d}{dx}(\frac{4x+6}{x^2+2x})-\frac{d}{dx}(\frac{2x}{x^2+1})\\[3mm]
\Rightarrow \frac{(x^2+2x)\frac{d}{dx}(4x+6)-(4x+6)\frac{d}{dx}(x^2+2x)}{(x^2+2x)^2}-\frac{(x^2+1)\frac{d}{dx}(2x)-(2x)\frac{d}{dx}(x^2+1)}{(x^2+1)^2}\\[3mm]
\Rightarrow \frac{(x^2+2x)\cdot4-(4x+6)\cdot(2x+2)}{(x^2+2x)^2}-\frac{(x^2+1)\cdot2-2x\cdot(2x))}{(x^2+1)^2}\\[3mm]
\Rightarrow \frac{4x^2+8x-8x^2-20x-12}{(x^2+2x)^2}-\frac{2x^2+2-4x^2}{(x^2+1)^2}\\[3mm]
\Rightarrow -\frac{4x^2+12x+12}{(x^2+2x)^2}+\frac{2x^2-2}{(x^2+1)^2}\\[3mm]
\Rightarrow \frac{2x^2-2}{(x^2+1)^2}-\frac{4x^2+12x+12}{(x^2+2x)^2}\\[3mm]
\Rightarrow \frac{(2x^2-2)(x^2+2x)^2-(4x^2+12x+12)(x^2+1)^2}{(x^2+1)^2(x^2+2x)^2}\\[3mm]
\Rightarrow \frac{(2x^2-2)(x^4+4x^3+4x^2)-(4x^2+12x+12)(x^4+2x^2+1)}{x^2(x^2+1)^2(x+2)^2}\\[3mm]
\Rightarrow \frac{2x^6+8x^5+8x^4-2x^4-8x^3-8x^2-4x^6-12x^5-12x^4-8x^4-24x^3-24x^2-4x^2-12x-12}{x^2(x^2+1)^2(x+2)^2}\\[3mm]
\Rightarrow \frac{-2x^6-4x^5-14x^4-32x^3-36x^2-12x-12}{x^2(x^2+1)^2(x+2)^2}$}
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    \textsc{Assignment 1}\\
    \textsc{Problem 4}\\
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$$\Rightarrow -\frac{4x^2+12x+12}{(x^2+2x)^2}+\frac{2x^2-2}{(x^2+1)^2}$$

$$\Rightarrow \frac{2x^2-2}{(x^2+1)^2}-\frac{4x^2+12x+12}{(x^2+2x)^2}$$

$$\Rightarrow \frac{(2x^2-2)(x^2+2x)^2-(4x^2+12x+12)(x^2+1)^2}{(x^2+1)^2(x^2+2x)^2}$$

$$\Rightarrow \frac{(2x^2-2)(x^4+4x^3+4x^2)-(4x^2+12x+12)(x^4+2x^2+1)}{x^2(x^2+1)^2(x+2)^2}$$

$$\Rightarrow \frac{2x^6+8x^5+8x^4-2x^4-8x^3-8x^2-4x^6-12x^5-12x^4-8x^4-24x^3-24x^2-4x^2-12x-12}{x^2(x^2+1)^2(x+2)^2}$$

$$\Rightarrow \frac{-2x^6-4x^5-14x^4-32x^3-36x^2-12x-12}{x^2(x^2+1)^2(x+2)^2}$$

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\Rightarrow \frac{2x^6+8x^5+8x^4-2x^4-8x^3-8x^2-4x^6-12x^5-12x^4-8x^4-24x^3-24x^2
-4x^2-12x-12}{x^2(x^2+1)^2(x+2)^2}\\[3mm]
\Rightarrow \frac{-2x^6-4x^5-14x^4-32x^3-36x^2-12x-12}{x^2(x^2+1)^2(x+2)^2}$}
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\end{center}
\Large {Given,$ (x-y)^2=x+y-1\\[3mm]
\Rightarrow x^2-2xy+y^2=x+y-1\\[3mm]
\Rightarrow \frac{d}{dx}(x^2-2xy+y^2)=\frac{d}{dx}(x+y-1)\\[3mm]
\Rightarrow 2x-2y+2y\frac{dy}{dx}-2x\frac{dy}{dx}=1+\frac{dy}{dx}-0\\[3mm]
\Rightarrow 2y\frac{dy}{dx}-2x\frac{dy}{dx}-\frac{dy}{dx}=1-2x+2y\\[3mm]
\Rightarrow \frac{d}{dx}(2y-2x-1)=2y-2x+1\\[3mm]
\Rightarrow\frac{d}{dx}=\frac{2y-2x+1}{2y-2x-1}\\[4mm]$
$\therefore \frac{d}{dx}=\frac{2y-2x+1}{2y-2x-1} $}
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    \textsc{Assignment 1}\\
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ASSIGNMENT 1
PROBLEM 4

<u>Ans to the question no 04</u>

Given, $(x-y)^2=x+y-1$

$\Rightarrow x^2-2xy+y^2=x+y-1$

$\Rightarrow \frac{d}{dx}(x^2-2xy+y^2)=\frac{d}{dx}(x+y-1)$

$\Rightarrow 2x-2y+2y\frac{dy}{dx}-2x\frac{dy}{dx}=1+\frac{dy}{dx}-0$

$\Rightarrow 2y\frac{dy}{dx}-2x\frac{dy}{dx}-\frac{dy}{dx}=1-2x+2y$

$\Rightarrow \frac{d}{dx}(2y-2x-1)=2y-2x+1$

$\Rightarrow \frac{d}{dx}=\frac{2y-2x+1}{2y-2x-1}$

$\therefore \frac{d}{dx}=\frac{2y-2x+1}{2y-2x-1}$

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$\therefore \frac{d}{dx}=\frac{2y-2x+1}{2y-2x-1} $}
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    \textsc{Assignment 1}\\
    \textsc{Problem 5}\\
    [1 cm]
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\begin{center}
  \textbf{\Large \underline {Ans to the question no 05}}\\
  [1 cm]
\end{center}
\Large {We have to evaluate,\\[0.5cm]
$\frac{d}{dx}(\sin^2{\frac{(2x)}{(x+1)}}) \\[0.5cm]
Let,\\[0.25cm]
a=\frac{2x}{x+1}\\
\Rightarrow a= 2x(x+1)^-1\\
\Rightarrow \frac{d}{dx}a=\frac{d}{dx} 2x(x+1)^-1\\
\Rightarrow \frac{d}{dx}(a)= 2(x+1)^-1+2x(-1)(x+1)^-2\\
\Rightarrow \frac{d}{dx}a=\frac{2}{x+1}-\frac{2x}{(x+1)^2}\\
\Rightarrow \frac{d}{dx}a=\frac{2(x+1)-2x}{(x+1)^2}\\
\Rightarrow \frac{d}{dx}a=\frac{2x+2-2x}{(x+1)^2}\\
\Rightarrow \frac{d}{dx}a=\frac{2}{(x+1)^2}\\[0.75cm]$
Evaluating,\\[0.5cm]
$\frac{d}{dx}(\sin^2{\frac{(2x)}{(x+1)}})\\
= \frac{d}{dx}(\sin^2a)\\
=2\sin{a}\cos{a}\frac{d}{dx}a\\
=\sin{2a}\frac{d}{dx}a\\
=\sin({\frac{2\cdot2x}{x+1}})\cdot\frac{2}{(x+1)^2}\\
=\frac{2\sin({\frac{4x}{x+1}})}{(x+1)^2}\\[0.25mm]$
We get, $\frac{d}{dx}(\sin^2{\frac{(2x)}{(x+1)}})=\frac{2\sin({\frac{4x}{x+1}})}{(x+1)^2}$}
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we get, $\frac{d}{dx}(\sin^2{\frac{(2x)}{(x+1)}})=\frac{2\sin({\frac{4x}{x+1}})}{(x+1)^2}$}
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    \begin{flushright}
    \textsc{Assignment 1}\\
    \textsc{Problem 6(a)}\\
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\begin{center}
  \textbf{\Large \underline {Ans to the question no 06 (a)}}\\
  [1 cm]
\end{center}
\Large {Given,\\[3mm]
$ P(t) = \frac{M}{1+Ae^-kt}\\[3mm]
\lim_{t \to \infty}P(t)= \lim_{t \to \infty}\frac{M}{1+Ae^-kt}\\[3mm]
\Rightarrow \lim_{t \to \infty}P(t) = \lim_{t \to \infty}\frac{M}{1+\frac{A}{e^kt}}\\[3mm]
\Rightarrow \lim_{t \to \infty}P(t) = \frac{M}{1+\frac{A}{e^k\infty}}\\[3mm]
\Rightarrow \lim_{t \to \infty}P(t) = \frac{M}{1+\frac{A}{\infty}}\\[3mm]
\Rightarrow \lim_{t \to \infty}P(t) = \frac{M}{1}
\Rightarrow \lim_{t \to \infty}P(t) = M $}\\[0.75cm]
The answer M refers to the maximum population size that can be carried and when t tends to infinity it means that the carrying capacity becomes the maximum population size that can be supported. That's why the answer M is to be expected
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Ans to the question no 06 (a)

Given,

$P(t) = \frac{M}{1+Ae^-kt}$

$\lim_{t \to \infty}P(t)= \lim_{t \to \infty}\frac{M}{1+Ae^-kt}$

$\Rightarrow \lim_{t \to \infty}P(t) = \lim_{t \to \infty}\frac{M}{1+\frac{A}{e^kt}}$

$\Rightarrow \lim_{t \to \infty}P(t) = \frac{M}{1+\frac{A}{e^k\infty}}$

$\Rightarrow \lim_{t \to \infty}P(t) = \frac{M}{1+\frac{A}{\infty}}$

$\Rightarrow \lim_{t \to \infty}P(t) = \frac{M}{1} \Rightarrow \lim_{t \to \infty}P(t) = M$

The answer M refers to the maximum population size that can be carried and when t tends to infinity it means that the carrying capacity becomes the maximum population size that can be supported. That's why the answer M is to be expected math assignment | Inbox (43) - shiha | Merge PDF - Con | Slack | announce | _nezukochan_ | Submission | Ass | MAT110 Assignm

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population size that can be supported. That's why the answer M is to be expected
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    \textsc{Assignment 1}\\
    \textsc{Problem 6(b)}\\
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\begin{center}
  \textbf{\Large \underline {Ans to the question no 06 (b)}}\\
  [1 cm]
\end{center}
\Large {Given,\\[3mm]
$ P(t) = \frac{M}{1+Ae^-kt}\\[3mm]
\lim_{M \to \infty}P(t)= \lim_{M \to \infty}\frac{M}{1+Ae^-kt}\\[3mm]
\Rightarrow \lim_{M \to \infty}P(t) =\lim_{t \to
\infty}\frac{M}{1+(\frac{M-P_o}{P_o})e^-kt}\\[3mm]
\Rightarrow \lim_{M \to \infty}P(t) =\lim_{M \to \infty}
\frac{MP_o}{P_o(1-e^-kt)+Me^-kt}\\[3mm]
\Rightarrow \lim_{M \to \infty}P(t) =\lim_{M \to \infty} \frac{P_o}{e^-kt}\\[3mm]
\Rightarrow \lim_{M \to \infty}P(t) = P_oe^{kt}\\[0.75cm]$
The result is $P_oe^{kt}$ which is an exponential function}
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<u>Ans to the question no 06 (b)</u>

Given,

$P(t) = \frac{M}{1+Ae^-kt}$

$\lim_{M \to \infty}P(t)= \lim_{M \to \infty}\frac{M}{1+Ae^-kt}$

$\Rightarrow \lim_{M \to \infty}P(t) =\lim_{t \to \infty}\frac{M}{1+(\frac{M-P_o}{P_o})e^-kt}$

$\Rightarrow \lim_{M \to \infty}P(t) =\lim_{M \to \infty} \frac{MP_o}{P_o(1-e^-kt)+Me^-kt}$

$\Rightarrow \lim_{M \to \infty}P(t) =\lim_{M \to \infty} \frac{P_o}{e^-kt}$

$\Rightarrow \lim_{M \to \infty}P(t) = P_oe^{kt}$

The result is P_oe^{kt} which is an exponential function