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Assignment

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Mata Sundri College For Women
University of Delhi

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EXAMPLE-9.5

Part 1

- Let $x = (x_1, \ldots, x_n)$, where the x_i are non negative real numbers. Set

$$M_r(x) = \left(\frac{x_1^r + x_2^r + \cdots + x_n^r}{n} \right)^{1/r}, \quad r \in R \setminus \{0\},$$

and

$$M_0(x) = (x_1 x_2 \ldots x_n)^{1/n}.$$

We call $M_r(x)$ the *rth power mean* of x.
Claim:

$$\lim_{r \to 0} M_r(x) = M_0(x).$$

- Define

$$V_n = \begin{bmatrix} 1 & 1 & 1 & \cdots & 1 \\ x_1 & x_2 & x_3 & \cdots & x_n \\ x_1^2 & x_2^2 & x_3^2 & \cdots & x_n^2 \\ \vdots & \vdots & \vdots & \ddots & \vdots \\ x_1^{n-1} & x_2^{n-1} & x_3^{n-1} & \cdots & x_n^{n-1} \end{bmatrix}.$$

We call V_n the *Vandermonde matrix* of order n. Claim:

$$\det V_n = \prod_{1 \le i < j \le n} (x_j - x_i).$$

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QUESTION 4:

$$3^3 + 4^3 + 5^3 = 6^3$$

$$\sqrt{100} = 10$$

$$(a+b)^3 = a^3 + 3a^2b + 3ab^2 + b^3$$

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$$\sum_{k=1}^{n} k = \frac{n(n+1)}{2}$$

$$\frac{\pi}{4} = \frac{1}{1} - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \frac{1}{9} - \frac{1}{11} + \cdots$$

$$Cos\theta = Sin(90^\circ - \theta)$$

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$$e^{\iota\theta} \quad = \quad Cos\theta + \iota Sin\theta$$

$$\lim_{\theta \to 0} \frac{Sin\theta}{\theta} = 1$$

$$\lim_{x \to \infty} \frac{\pi(x)}{x/logx} = 1$$

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$$\int_{-\infty}^{\infty} e^{-x^2} dx = \sqrt{\pi}$$

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QUESTION 5:

Positive numbers a, b and c are side lengths of a triangle if and only if $a+b>c$,$b+c>a$, and $c+a>b$.

The area of a triangle with side length a, b, c is given by *Heron's Formula* :$A=\sqrt{s(s-a)(s-b)(s-c)}$ where S is the *semiperimeter* $\frac{(a+b+c)}{2}$.

The volume of a regular tetrahedron of edge length 1 is $\frac{\sqrt{2}}{12}$.

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The quadratic equation $ax^2 + bx + c = 0$ has roots $r_1, r_2 = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$.

The derivative of a function f, denoted f', is defined by

$$f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$$

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The real valued function f is convex on an interval I if

$$f(\lambda x + (1-\lambda)y) \leq \lambda f(x) + (1-\lambda)f(y)$$

, for all $x, y \in$ I and $0 \leq \lambda \leq 1$.

The general solution of a differential equation

$$y'' - 3y' + 2y = 0$$

is

$$y = C_1 e^x + C_2 e^{2x}$$

.

The *Fermat* number F_n is defined as $F_n = 2^{2^n}, n \geq 0$

QUESTION 6:

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

$$\lim_{n\to\infty}(1+\frac{1}{n})^n = e$$

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$$\begin{vmatrix} a & b \\ c & d \end{vmatrix} = ad - bc$$

$$R_{\circ} = \begin{bmatrix} Cos\theta & -Sin\theta \\ Sin\theta & Cos\theta \end{bmatrix}$$

$$\begin{vmatrix} i & j & k \\ a_1 & a_2 & a_3 \\ b_1 & b_2 & b_3 \end{vmatrix} = \begin{vmatrix} a_2 & a_3 \\ b_2 & b_3 \end{vmatrix} i - \begin{vmatrix} a_1 & a_3 \\ b_1 & b_3 \end{vmatrix} j + \begin{vmatrix} a_1 & a_2 \\ b_1 & b_2 \end{vmatrix} k$$

$$\begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{bmatrix} \begin{bmatrix} b_{11} & b_{12} \\ b_{21} & b_{22} \end{bmatrix} = \begin{bmatrix} a_{11}b_{11} + a_{12}b_{21} & a_{11}b_{12} + a_{12}b_{12} \\ a_{21}b_{11} + a_{22}b_{21} & a_{21}b_{12} + a_{22}b_{22} \end{bmatrix}$$

$$\begin{cases} -x^2 & ,0 < x \\ x^4 & ,0 \leq x \leq 2 \\ 4 & ,x > 2 \end{cases}$$

QUESTION 7 :

$$
\begin{aligned}
1+2 &= 3\\
4+5+6 &= 7+8\\
9+10+11+12 &= 13+14+15\\
16+17+18+19+20 &= 21+22+23+24\\
25+26+27+28+29+30 &= 31+32+33+34+35
\end{aligned}
$$

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$$
\begin{aligned}
(a+b)^2 &= (a+b)(a+b)\\
&= (a+b)a+(a+b)b\\
&= a(a+b)+b(a+b)\\
&= a^2+ab+ba+b^2\\
&= a^2+ab+ab+b^2\\
&= a^2+2ab+b^2
\end{aligned}
$$

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$$
\begin{aligned}
tan(\alpha+\beta+\gamma) &= \frac{tan(\alpha+\beta)+tan\gamma}{1-tan(\alpha+\beta)tan\gamma} \\
&= \frac{\frac{tan\alpha+tan\beta}{1-tan\alpha tan\beta}+tan\gamma}{1-\frac{tan\alpha+tan\beta}{1-tan\alpha tan\beta}tan\gamma} \\
&= \frac{tan\alpha+tan\beta+(1-tan\alpha tan\beta)tan\gamma}{1-tan\alpha tan\beta-(tan\alpha+tan\beta)tan\gamma} \\
&= \frac{tan\alpha+tan\beta+tan\gamma-tan\alpha tan\beta tan\gamma}{1-tan\alpha tan\beta-tan\beta tan\gamma-tan\gamma tan\alpha}
\end{aligned}
$$

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$$
\begin{aligned}
\prod_p (1 - \frac{1}{p^2}) &= \prod_p \frac{1}{1 + \frac{1}{p^2} + \frac{1}{p^4} + \cdots} \\
&= (\prod_p (1 + \frac{1}{p^2} + \frac{1}{p^4} + \cdots))^{-1} \\
&= (1 + \frac{1}{2^2} + \frac{1}{3^2} + \frac{1}{4^2} + \cdots)^{-1} \\
&= \frac{6}{\pi^2}
\end{aligned}
$$


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Assignment

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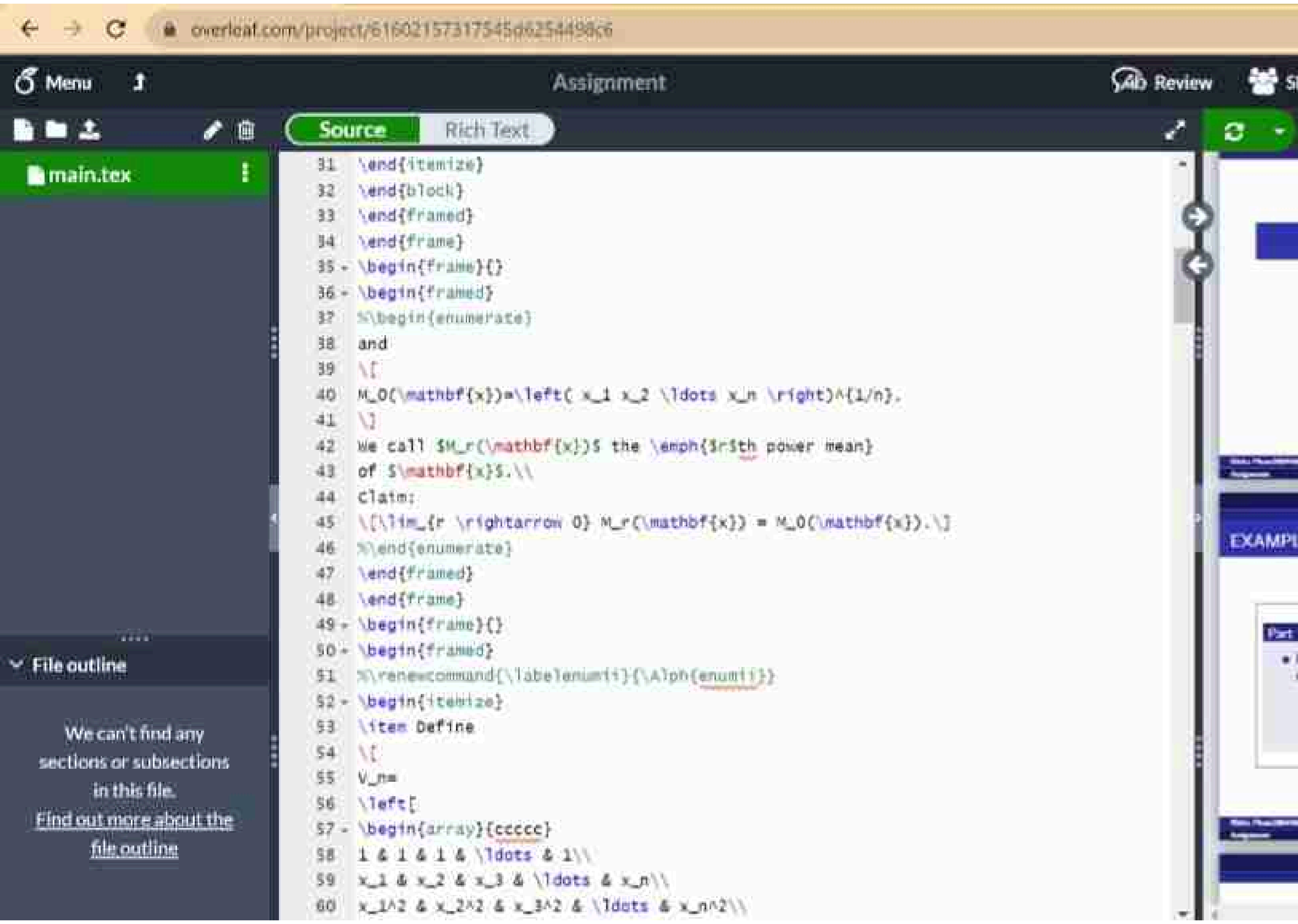
```
\documentclass{beamer}
\usepackage[utf8]{inputenc}
\usepackage{xcolor}
\usepackage{framed}
\usepackage{fancybox}
\usepackage{graphicx}

\title{Assignment}
\author{Name:Ritika Phore\\University Roll No.-20044563028}
\institute{Mata Sundri College For Women\\University of Delhi}
\date{}
\usetheme{Berlin}
%\usecolortheme{beaver}
\begin{document}
\begin{frame}
\titlepage
\end{frame}

\begin{frame}{EXAMPLE-9.5}
\begin{framed}
\begin{block}{Part 1}
%\renewcommand{\labelenumi}{\Alph{enumi}}
\begin{itemize}
\item Let $\mathbf{x}=(x_1,\ldots,x_n)$,
where the $x_i$ are non negative real numbers.
Set
\[
M_r(\mathbf{x}) = \left(\frac{x_1^r+x_2^r
+\cdots+x_n^r}{n}\right)^{1/r},
\; \; r \in \mathbf{R} \setminus \{0\},
```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\end{itemize}
\end{block}
\end{framed}
\end{frame}
\begin{frame}{}
\begin{framed}
%\begin{enumerate}
and
\[
M_0(\mathbf{x})=\left(x_1 x_2 \ldots x_n \right)^{1/n}.
\]
We call $M_r(\mathbf{x})$ the \emph{rth power mean}
of $\mathbf{x}$.\\
Claim:
\[\lim_{r \rightarrow 0} M_r(\mathbf{x}) = M_0(\mathbf{x}).\]
%\end{enumerate}
\end{framed}
\end{frame}
\begin{frame}{}
\begin{framed}
%\renewcommand{\labelenumii}{\Alph{enumii}}
\begin{itemize}
\item Define
\[
V_n=
\left[
\begin{array}{ccccc}
1 & 1 & 1 & \ldots & 1\\
x_1 & x_2 & x_3 & \ldots & x_n\\
x_1^2 & x_2^2 & x_3^2 & \ldots & x_n^2\\
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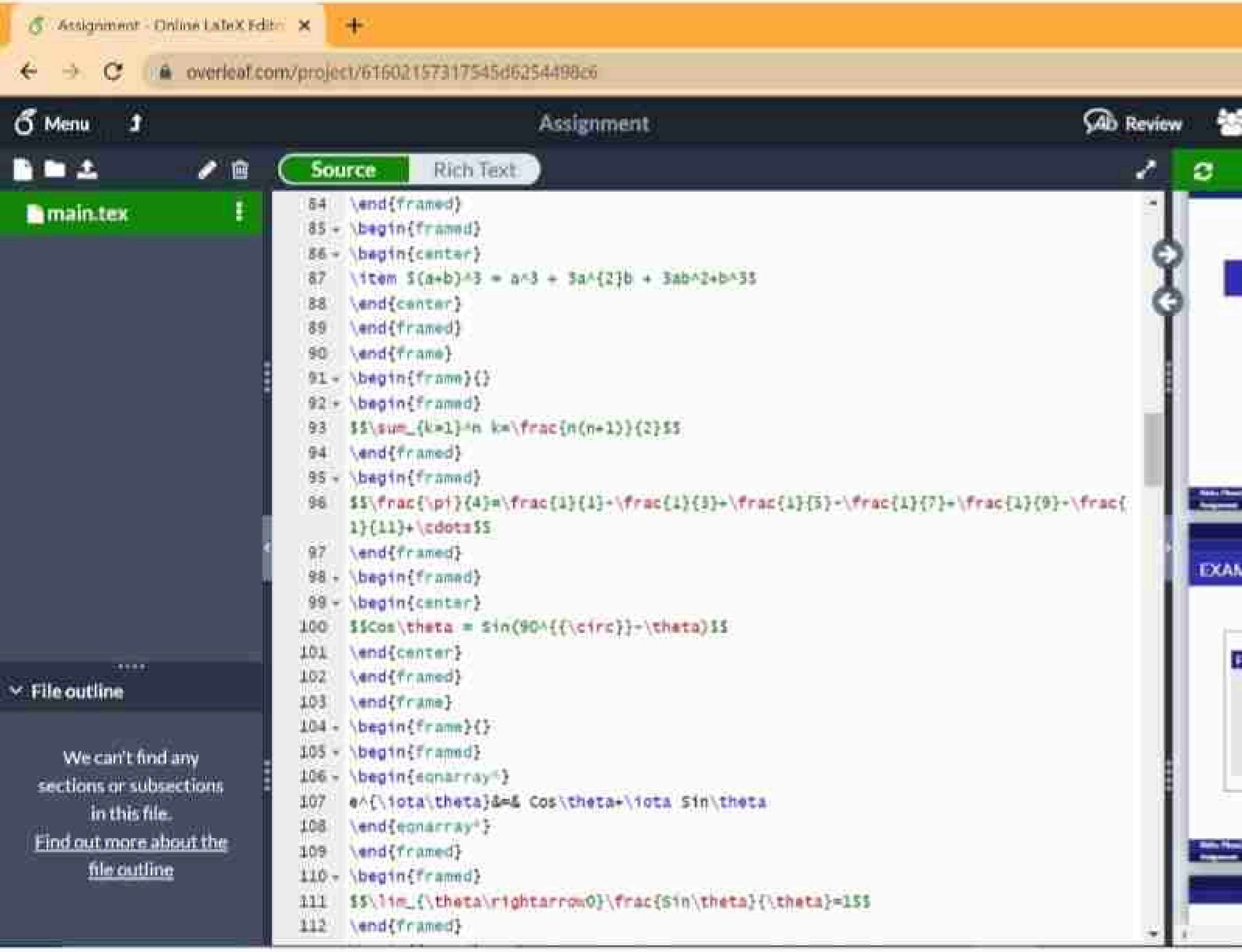
```
\begin{array}{ccccc}
1 & 1 & 1 & \ldots & 1\\
x_1 & x_2 & x_3 & \ldots & x_n\\
x_1^2 & x_2^2 & x_3^2 & \ldots & x_n^2\\
\vdots & \vdots & \vdots & \ddots & \vdots\\
x_1^{n-1} & x_2^{n-1} & x_3^{n-1} & \ldots & x_n^{n-1}
\end{array}
\right].
\]
We call $V_n$ the \emph{Vandermonde matrix} of order $n$.
Claim:
\[
\det V_n = \prod_{1 \leq i < j \leq n}(x_j-x_i).
\]
\end{itemize}
\end{framed}
\end{frame}
\begin{frame}{QUESTION 4:}
\begin{framed}
\begin{center}
$3^3+4^3+5^3=6^3$
\end{center}
\end{framed}
\begin{framed}
\begin{center}
$\sqrt{100}=10$
\end{center}
\end{framed}
\begin{framed}
\begin{center}
```

EXAMPL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\end{framed}
\begin{framed}
\begin{center}
\item $(a+b)^3 = a^3 + 3a^{2}b + 3ab^2+b^3$
\end{center}
\end{framed}
\end{frame}
\begin{frame}{}
\begin{framed}
$$\sum_{k=1}^n k=\frac{n(n+1)}{2}$$
\end{framed}
\begin{framed}
$$\frac{\pi}{4}=\frac{1}{1}-\frac{1}{3}+\frac{1}{5}-\frac{1}{7}+\frac{1}{9}-\frac{1}{11}+\cdots$$
\end{framed}
\begin{framed}
\begin{center}
$$Cos\theta = Sin(90^{{\circ}}-\theta)$$
\end{center}
\end{framed}
\end{frame}
\begin{frame}{}
\begin{framed}
\begin{eqnarray*}
e^{\iota\theta}&=& Cos\theta+\iota Sin\theta
\end{eqnarray*}
\end{framed}
\begin{framed}
$$\lim_{\theta\rightarrow0}\frac{Sin\theta}{\theta}=1$$
\end{framed}
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```latex
$$\lim_{\theta\rightarrow0}\frac{Sin\theta}{\theta}=1$$
\end{framed}
\begin{framed}
 $$\lim_{x\rightarrow\infty}\frac{\pi(x)}{x/logx}=1$$
\end{framed}
\end{frame}
\begin{frame}{}
\begin{framed}
$$\int_{-\infty}^\infty e^{-x^{2}}dx = \sqrt{\pi}$$
\end{framed}
\end{frame}
\begin{frame}{QUESTION 5:}
\begin{framed}
Positive numbers $a,b$ and $c$ are side lengths of a triangle if and only if $a+b>c$,$b+c>a$, and $c+a>b$.
\end{framed}
\begin{framed}
The area of a triangle with side length $a$, $b$, $c$ is given by \emph{Heron's Formula} :$A=\sqrt{s(s-a)(s-b)(s-c)}$ where $s$ is the \emph{semiperimeter} $\frac{(a+b+c)}{2}$.
\end{framed}
\begin{framed} The volume of a regular tetrahedron of edge length 1 is $\frac{\sqrt{2}}{12}$.
\end{framed}
\end{frame}
\begin{frame}{}
\begin{framed}
 The quadratic equation $ax^2+bx+c=0$ has roots $r_1,r_2 = \frac{-b\pm \sqrt{b^2-4ac}}{2a}$.
\end{framed}
```

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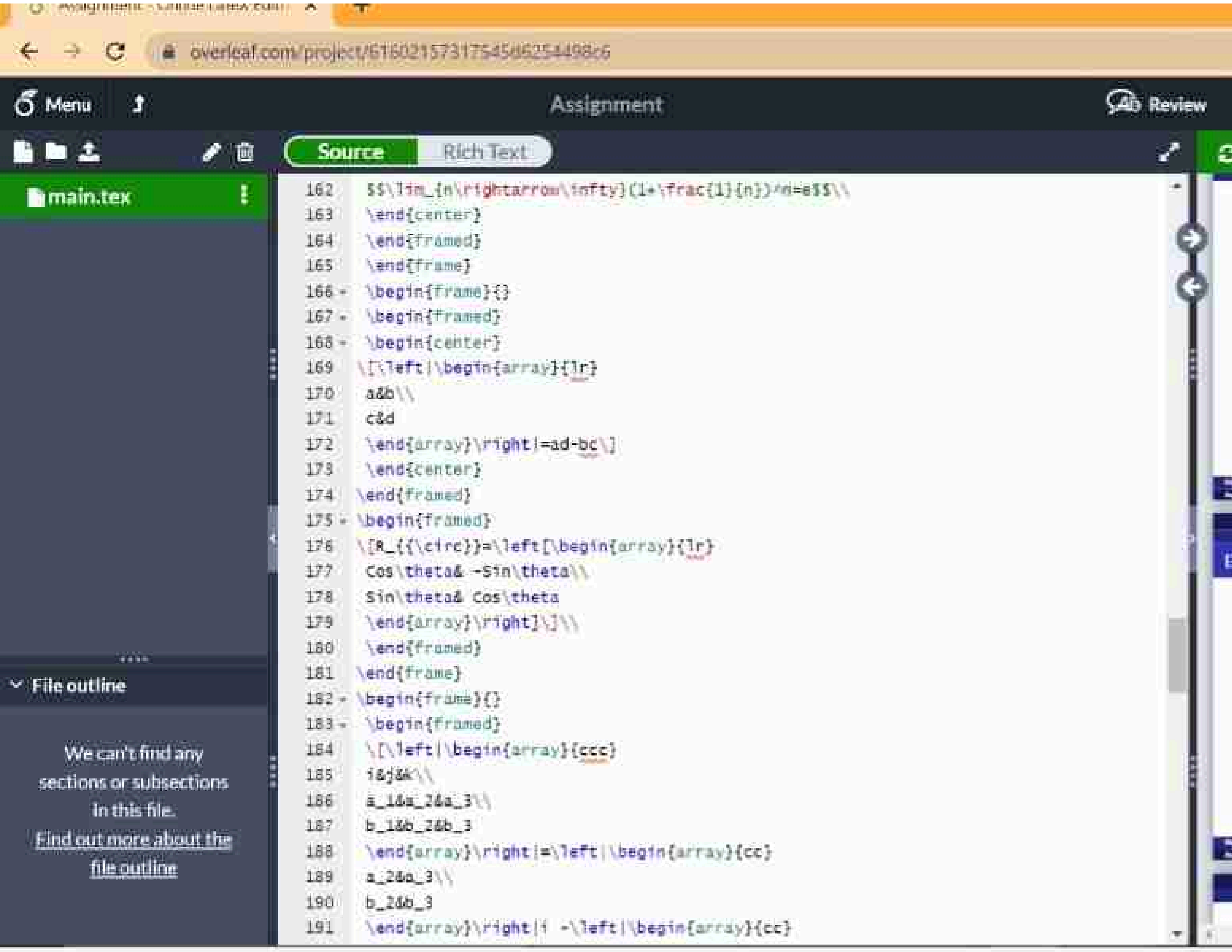
```
\begin{framed}
The derivative of a function $f$, denoted $f'$, is defined by
$$f'(x)=\lim_{h\rightarrow0}\frac{f(x+h)-f(x)}{h}$$
\end{framed}
\end{frame}
\begin{frame}{}
\begin{framed}
The real valued function $f$ is convex on an interval I if $$f(\lambda
x+(1-\lambda)y)\leq \lambda f(x)+(1-\lambda)f(y)$$, for all $x,y \in$ I and $0\leq
\lambda\leq 1$.
\end{framed}
\begin{framed}
The general solution of a differential equation $$y''-3y'+2y=0$$ is $$y=C_1
e^{x}+C_2 e^{2x}$$.
\end{framed}
\end{frame}
\begin{frame}{}
\begin{framed}
The \emph{Fermat} number $F_n$ is defined
as $F_n=2^{2^{n}}, n\geq0$
\end{framed}
\end{frame}
\begin{frame}{QUESTION 6:}
\begin{framed}
\begin{center}
 $$\frac{d\frac{x}{x+1}}{dx}=\frac{1}{(x+1)^2}$$\\
 \end{center}
 \end{framed}
 \begin{framed}
 \begin{center}
```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$$\lim_{n\rightarrow\infty}(1+\frac{1}{n})^n=e$$\\
\end{center}
\end{framed}
\end{frame}
\begin{frame}{}
\begin{framed}
\begin{center}
\[\left|\begin{array}{lr}
a&b\\
c&d
\end{array}\right|=ad-bc\]
\end{center}
\end{framed}
\begin{framed}
\[R_{{\circ}}=\left[\begin{array}{lr}
Cos\theta& -Sin\theta\\
Sin\theta& Cos\theta
\end{array}\right]\]\\
\end{framed}
\end{frame}
\begin{frame}{}
\begin{framed}
\[\left|\begin{array}{ccc}
i&j&k\\
a_1&a_2&a_3\\
b_1&b_2&b_3
\end{array}\right|=\left|\begin{array}{cc}
a_2&a_3\\
b_2&b_3
\end{array}\right|i -\left|\begin{array}{cc}

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```
a_2&a_3\\
b_2&b_3
\end{array}\right|i -\left|\begin{array}{cc}
a_1&a_3\\
b_1&b_3
\end{array}\right|j +\left|\begin{array}{cc}
a_1&a_2\\
b_1&b_2
\end{array}\right|k\]\\
\end{framed}
\begin{framed}
\[\left[\begin{array}{lr}
 a_{11}&a_{12}\\
 a_{21}&a_{22}
 \end{array}\right]
 \left[\begin{array}{lr}
 b_{11}&b_{12}\\
 b_{21}&b_{22}
 \end{array}\right]=\left[\begin{array}{lr}
 a_{11}b_{11}+a_{12}b_{21}&a_{11}b_{12}+a_{12}b_{12}\\
 a_{21}b_{11}+a_{22}b_{21}&a_{21}b_{12}+a_{22}b_{22}
 \end{array}\right]\]
\end{framed}
\end{frame}
\begin{frame}{}
 \begin{framed}
\[\left\{\begin{array}{ll}
 -x^2&,0<x\\
  x^4&,0\leq x\leq2\\
  4&,x>2
```

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```
\[\left\{\begin{array}{ll}
 -x^2&,0<x\\
  x^4&,0\leq x\leq2\\
  4&,x>2
  \end{array}\right.\]
  %\end{framed}
\end{framed}
\end{frame}
\begin{frame}{QUESTION 7 :}
\begin{framed}
\begin{eqnarray*}
1+2&=&3\\
4+5+6&=&7+8\\
9+10+11+12&=&13+14+15\\
16+17+18+19+20&=&21+22+23+24\\
25+26+27+28+29+30&=&31+32+33+34+35
\end{eqnarray*}
\end{framed}
\end{frame}
\begin{frame}{}
\begin{framed}
\begin{eqnarray*}
(a+b)^2&=&(a+b)(a+b)\\
&=&(a+b)a+(a+b)b\\
&=&a(a+b)+b(a+b)\\
&=&a^2+ab+ba+b^2\\
&=&a^2+ab+ab+b^2\\
&=&a^2+2ab+b^2
\end{eqnarray*}
\end{framed}
```

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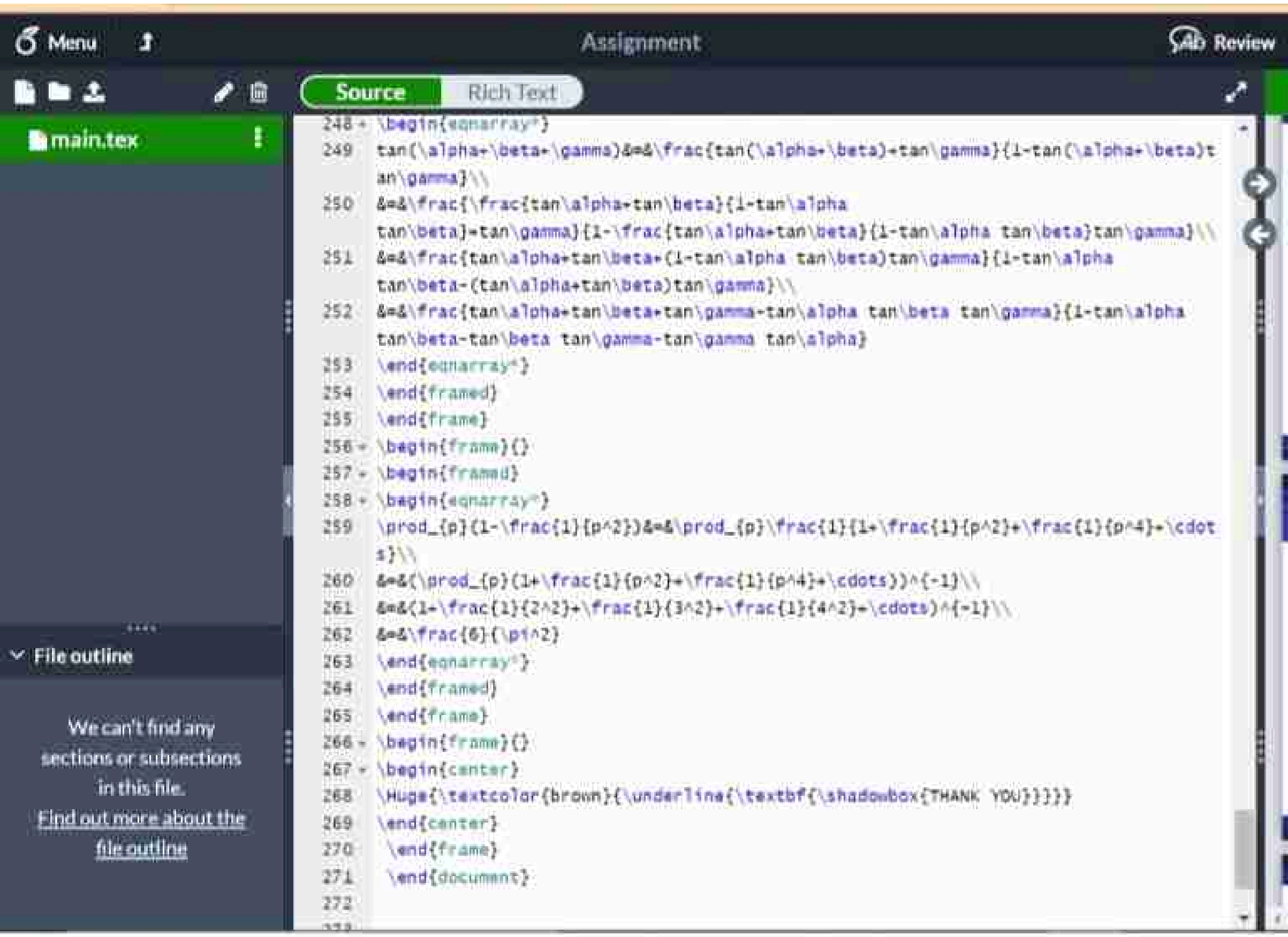
```
\end{frame}
\begin{frame}{}
\begin{framed}
\begin{eqnarray*}
tan(\alpha+\beta+\gamma)&=&\frac{tan(\alpha+\beta)+tan\gamma}{1-tan(\alpha+\beta)tan\gamma}\\
&=&\frac{\frac{tan\alpha+tan\beta}{1-tan\alpha tan\beta}+tan\gamma}{1-\frac{tan\alpha+tan\beta}{1-tan\alpha tan\beta}tan\gamma}\\
&=&\frac{tan\alpha+tan\beta+(1-tan\alpha tan\beta)tan\gamma}{1-tan\alpha tan\beta-(tan\alpha+tan\beta)tan\gamma}\\
&=&\frac{tan\alpha+tan\beta+tan\gamma-tan\alpha tan\beta tan\gamma}{1-tan\alpha tan\beta-tan\beta tan\gamma-tan\gamma tan\alpha}
\end{eqnarray*}
\end{framed}
\end{frame}
\begin{frame}{}
\begin{framed}
\begin{eqnarray*}
\prod_{p}(1-\frac{1}{p^2})&=&\prod_{p}\frac{1}{1+\frac{1}{p^2}+\frac{1}{p^4}+\cdots}\\
&=&(\prod_{p}(1+\frac{1}{p^2}+\frac{1}{p^4}+\cdots))^{-1}\\
&=&(1+\frac{1}{2^2}+\frac{1}{3^2}+\frac{1}{4^2}+\cdots)^{-1}\\
&=&\frac{6}{\pi^2}
\end{eqnarray*}
\end{framed}
\end{frame}
\begin{frame}{}
\begin{center}
\Huge{\textcolor{brown}{\underline{\textbf{\shadowbox{THANK YOU}}}}}
\end{center}
```




```
\begin{eqnarray*}
tan(\alpha+\beta+\gamma)&=&\frac{tan(\alpha+\beta)+tan\gamma}{1-tan(\alpha+\beta)tan\gamma}\\
&=&\frac{\frac{tan\alpha+tan\beta}{1-tan\alpha tan\beta}+tan\gamma}{1-\frac{tan\alpha+tan\beta}{1-tan\alpha tan\beta}tan\gamma}\\
&=&\frac{tan\alpha+tan\beta+(1-tan\alpha tan\beta)tan\gamma}{1-tan\alpha tan\beta-(tan\alpha+tan\beta)tan\gamma}\\
&=&\frac{tan\alpha+tan\beta+tan\gamma-tan\alpha tan\beta tan\gamma}{1-tan\alpha tan\beta-tan\beta tan\gamma-tan\gamma tan\alpha}
\end{eqnarray*}
\end{framed}
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\begin{frame}{}
\begin{framed}
\begin{eqnarray*}
\prod_{p}(1-\frac{1}{p^2})&=&\prod_{p}\frac{1}{1+\frac{1}{p^2}+\frac{1}{p^4}+\cdots}\\
&=&(\prod_{p}(1+\frac{1}{p^2}+\frac{1}{p^4}+\cdots))^{-1}\\
&=&(1+\frac{1}{2^2}+\frac{1}{3^2}+\frac{1}{4^2}+\cdots)^{-1}\\
&=&\frac{6}{\pi^2}
\end{eqnarray*}
\end{framed}
\end{frame}
\begin{frame}{}
\begin{center}
\Huge{\textcolor{brown}{\underline{\textbf{\shadowbox{THANK YOU}}}}}
\end{center}
 \end{frame}
 \end{document}
```