MA1201 Calc & Basic Linear Algebra II (2015/16), Test-I (**70 mins**)

Section: E F G H **Name:** **Student Number:**

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1. Let $\vec{u} = \vec{i} - 2\vec{j} + 3\vec{k}$, $\vec{v} = -2\vec{i} + \vec{j} - 4\vec{k}$ and $\vec{w} = -\vec{i} - 2\vec{j} + 2\vec{k}$ in $\mathbf{R^3}$.

(a) Calculate the $\vec{u} \cdot (\vec{v} + \vec{w})$ and the angle between the vectors $\vec{u}$ and $\vec{v} + \vec{w}$. (15 marks)

(b) Calculate the volume of the parallelepiped with $\vec{u}, \vec{v}, \vec{w}$ as adjacent sides. (15 marks)

2. Evaluate the following integrals.

$(a) \int \frac{\sqrt{x}+1}{x} dx$, (10 marks) $(b) \int (2x-1)e^{-x} dx$, (10 marks)

$(c) \int \frac{1}{\sqrt{x^2 - 2x + 5}}$ (15 marks), $(d) \int_{-1}^{2} |x(x-2)| dx$, (15 marks)

$(e) \int \frac{13 - x}{(2x-1)(x^2 + 2x + 5)} dx$ (20 marks).

——— end ———

Not to be taken away

Brief Table of Derivatives and Integrals

Standard Derivatives	Standard Integrals
$\frac{d}{dx}(x^p) = px^{p-1}$	$\int x^p dx = \frac{x^{p+1}}{p+1} + C, \quad p \neq -1$
$\frac{d}{dx}(\ln x) = \frac{1}{x}$	$\int \frac{1}{x} dx = \ln\lvert x\rvert + C$
$\frac{d}{dx}(e^x) = e^x$	$\int e^x dx = e^x + C$
$\frac{d}{dx}(\sin x) = \cos x$	$\int \cos x \, dx = \sin x + C$
$\frac{d}{dx}(\cos x) = -\sin x$	$\int \sin x \, dx = -\cos x + C$
$\frac{d}{dx}(\tan x) = \sec^2 x$	$\int \sec^2 x \, dx = \tan x + C$
$\frac{d}{dx}(\cot x) = -\csc^2 x$	$\int \csc^2 x \, dx = -\cot x + C$
$\frac{d}{dx}(\sec x) = \sec x \tan x$	$\int \sec x \tan x \, dx = \sec x + C$
$\frac{d}{dx}(\csc x) = -\csc x \cot x$	$\int \csc x \cot x \, dx = -\csc x + C$
$\frac{d}{dx}(\sin^{-1} x) = \frac{1}{\sqrt{1-x^2}}$	$\int \frac{dx}{\sqrt{1-x^2}} = \sin^{-1} x + C$
$\frac{d}{dx}(\cos^{-1} x) = \frac{-1}{\sqrt{1-x^2}}$	
$\frac{d}{dx}(\tan^{-1} x) = \frac{1}{1+x^2}$	$\int \frac{dx}{1+x^2} = \tan^{-1} x + C$

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