Faculty of Science »
Department of mathematics and statistics

MAT 1341C Diagnostic test 2011

January 15, 2011. Duration: 80 minutes

Instructor: Barry Jessup

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Total	

θ	$\sin\theta$	$\cos\theta$
0	0	1
$\frac{\pi}{6}$	$\frac{1}{2}$	$\frac{\sqrt{3}}{2}$
$\frac{\pi}{4}$	$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{2}}{2}$
$\frac{\pi}{3}$	$\frac{\sqrt{3}}{2}$	$\frac{1}{2}$
$\frac{\pi}{2}$	1	0

Family Name:________________________

First Name:__________________________

Student number:______________________

PLEASE READ THESE INSTRUCTIONS CAREFULLY.

1. You have 80 minutes to complete this exam.
2. This is a closed book exam, and no notes of any kind are allowed. The use of any text storage or communication device is not permitted.
3. Read each question carefully – you will save yourself time and unnecessary grief later on.
4. All questions are multiple choice, are worth 1 point each and no part marks will be given. Please record your answers in the space provided above.
5. Where it is possible to check your work, do so.
6. Good luck! Bonne chance!

1. An equation for the plane passing through the points $(1, 2, -1)$ and $(2, 3, 1)$, which is parallel to the x-axis is:

A. $7x - 3y + -2z = 3$
B. $2y - z = 5$
C. $x + y - z = 4$
D. $x - y = -1$
E. $2y - z = 0$
F. $x + y + z = 2$

2. Find an equation of the plane which passes through the point $(1,\ 8,\ -7)$ and which is perpendicular to the line whose parametric equations are:

$$x = 2 + 2t,\ y = 1 + t,\ z = 3 - 4t;\ t \in \mathbf{R}.$$

A. $2x + y - 4z = 6$
B. $2x + y + 3z = -11$
C. $2x - 3y + 7z = -71$
D. $2x - 4y + z = -28$
E. $2x + y - 4z = 38$
F. $-4x + y + 2z = 10$

3. Find parametric equations for the line passing through $(-1,\ 1,\ 1)$ and which is perpendicular to the plane $3x - y + 2z = 1$.

A. $x = -1 + 3t,\ y = 1 + t,\ z = 1 - 2t,\ t \in \mathbf{R}$
B. $x = -1 + 3t,\ y = 1 - t,\ z = 1 + 2t,\ t \in \mathbf{R}$
C. $x = -1 - 6t,\ y = 1 + t,\ z = 1 - t,\ t \in \mathbf{R}$
D. $x = -1 - 3t,\ y = 1 - t,\ z = 1 - 2t,\ t \in \mathbf{R}$
E. $x = -1 - t,\ y = 1 + t,\ z = 1 + t,\ t \in \mathbf{R}$
F. $x = 1 - 4t,\ y = 1 - t,\ z = -1 - 3t,\ t \in \mathbf{R}$

4. If $u = (3,\ -3,\ -1),\ v = (-5,\ 4,\ -4)$ and $w = (0,\ 3,\ 4)$, find $\|(2u + v) \times w\|$.

A. $2\sqrt{5}$
B. $2\sqrt{10}$
C. $5\sqrt{2}$
D. $10\sqrt{5}$
E. 25
F. $5\sqrt{5}$

5. Find a scalar equation for the plane with vector parametric equation

$$v = (2, 4, 3) + s(1, 2, -1) + t(3, -4, 0); s, t \in \mathbf{R}.$$

A. $4x - 3y + 10z = -50$

B. $4x + 3y - 10z = 50$

C. $4x - 3y + 10z = 50$

D. $-4x + 3y + 10z = 50$

E. $4x + 3y + 10z = -50$

F. $4x + 3y + 10z = 50$

6. If $A = (3,\ 0,\ 9)$, $B = (2,\ 4,\ 1)$ and $C = (1,\ 4,\ 0)$, find the angle $\angle ABC$.

A. $\pi/2$
B. $\pi/3$
C. $\pi/4$
D. $\pi/6$
E. $3\pi/4$
F. $4\pi/3$

7. If $u = (3,\ 3,\ 3)$ and $v = (2,\ 1,\ 3)$ find the orthogonal projection of u on v, i.e. $\text{proj}_v u$.

A. $\frac{9}{7}(2,\ 1,\ 3)$

B. $\frac{12}{7}(2,\ 1,\ 3)$

C. $\frac{9\sqrt{14}}{7}(2,\ 1,\ 3)$

D. $\frac{2}{2}(3,\ 3,\ 3)$

E. $\frac{9}{7}(3,\ 3,\ 3)$

F. $6\sqrt{3}\ (1,\ 1,\ 1)$

8. Find the volume of the parallelepiped determined by the vectors $u = (1,\ 1,\ -1)$, $v = (2,\ 0,\ 1)$ and $w = (1,\ -1,\ 3)$.

A. -2
B. 4
C. 6
D. 8
E. 16
F. 2

9. What is the area of the <u>triangle</u> with vertices (3, 0, - 2), (5, 2, -1) and (5, 9, 0)?

A. 11
B. 13
C. 15
D. $\frac{13}{2}$
E. $\frac{15}{2}$
F. $\frac{17}{2}$

10. The intersection of the planes with equations $x + 11y - 4z = 40$ and $x - y = -8$ is the line with (vector) parametric equation:

A. $(-4,\ 4,\ 0) + t(1,\ 3,\ 1),\ t \in \mathbf{R}$
B. $(4,\ 4,\ 0) + t(1,\ 1,\ 8),\ t \in \mathbf{R}$
C. $(-4,\ 4,\ 0) + t(1,\ 1,\ 3),\ t \in \mathbf{R}$
D. $(4,\ -4,\ 0) + t(-1,\ 1,\ -3),\ t \in \mathbf{R}$
E. $(0,\ 4,\ -4) + t(1,\ 3,\ -1),\ t \in \mathbf{R}$
F. $(4,\ 0,\ 4) + t(-1,\ 3,\ 1),\ t \in \mathbf{R}$

11. Express the following complex numbers in the form $a + b\,i$:

$$z_1 = \frac{1}{1+i}$$

$$z_2 = (2+i)(2+2i)$$

A. $z_1 = 1 - i \ ; \ z_2 = 4 + 4i$

B. $z_1 = -1 + i \ ; \ z_2 = 2 + 4i$

C. $z_1 = \frac{1}{2} + \frac{1}{2}i \ ; \ z_2 = 2 - 6i$

D. $z_1 = \frac{1}{2} - \frac{1}{2}i \ ; \ z_2 = 2 + 6i$

E. $z_1 = 2 - \frac{1}{4}i \ ; \ z_2 = 6 - 2i$

F. $z_1 = 1 - i \ ; \ z_2 = 0$

12. Find the polar form of $\dfrac{1-\sqrt{3}i}{-1+i}$

A. $\sqrt{2}\Big(\cos(-\frac{5\pi}{12}) + i\sin(-\frac{5\pi}{12})\Big)$

B. $\sqrt{2}\Big(\cos(\frac{11\pi}{12}) + i\sin(\frac{11\pi}{12})\Big)$

C. $\sqrt{2}\Big(\cos(-\frac{7\pi}{12}) + i\sin(-\frac{7\pi}{12})\Big)$

D. $\sqrt{2}\Big(\cos(\frac{5\pi}{12}) + i\sin(\frac{5\pi}{12})\Big)$

E. $\sqrt{2}\Big(\cos(-\frac{\pi}{12}) + i\sin(-\frac{\pi}{12})\Big)$

F. $\sqrt{2}\Big(\cos(\frac{\pi}{12}) + i\sin(\frac{\pi}{12})\Big)$