M252 Practice Exam 3—Formula Recitation Section

<u>Chapter 10 Formulas</u>

Let P=(x_0,y_0,z_0) and Q=(x_1,y_1,z_1) be points in 3-Space; **u** = <u_1,u_2,u_3>, **v** = <v_1,v_2,v_3>, **w** = <w_1,w_2,w_3>, **n** = <a,b,c>, **n**$_1$, and **n**$_2$ be vectors in 3-Space. Vectors are shown in bold for the questions. Use the arrow notation for vectors in your answers.

Give the formulas for the following:

The dot product of **u** and **v**:	The cosine of the angle between **u** and **v**:
u and **v** are orthogonal:	The projection of **u** onto **v**:
The norm of **v**:	The vector component of **u** orthogonal to **v**:
The unit vector in the direction of **v**:	The cross product of **u** and **v**.

The vector equation of a line through P and parallel to <a,b,c>:	The standard equation of a plane through P with normal vector <a,b,c>:
The parametric equations of a line through P and parallel to **v**:	The cosine of the angle between two planes with normal vectors $\mathbf{n}_1$ and $\mathbf{n}_2$:
The vector equation of a line through P and Q:	The distance between the point Q and a plane through P with normal vector **n**:
The vector equation of a plane through P with normal vector **n** = <a,b,c>:	The distance between the point Q and a line through P with direction vector **u**:
The volume of the parallelepiped with vectors **u**, **v**, and **w** as adjacent edges:	The triple scalar product of **u**, **v**, and **w**:

Chapter 11 Formulas

Let $f(t)$ be a real valued function of t; $\mathbf{r}(t) = \langle x(t), y(t), z(t)\rangle$ and $\mathbf{u}(t)$ be vector valued functions; $\mathbf{r}(t)$ be the position vector, $\mathbf{v}(t)$ be the velocity, and $\mathbf{a}(t)$ be the acceleration; C be a smooth curve given by $\mathbf{r}(t) = x(t)\mathbf{i} + y(t)\mathbf{j} + z(t)\mathbf{k}$ on the interval (a,b).

Give the formulas for the following:

$\mathbf{r}(t)$ is continuous at the point $t = a$:	$D_t\,[\mathbf{r}(f(t))] =$
The derivative of $\mathbf{r}(t)$:	If $\mathbf{r}(t) \cdot \mathbf{r}(t) =$ constant then
$D_t\,[\mathbf{r}(t) + \mathbf{u}(t)] =$	$\int \vec{r}(t)\,dt =$
$D_t\,[\mathbf{r}(t) \cdot \mathbf{u}(t)] =$	Velocity: $\mathbf{v}(t) =$
$D_t\,[\mathbf{r}(t) \times \mathbf{u}(t)] =$	Acceleration: $\mathbf{a}(t) =$
$D_t\,[f(t)\mathbf{r}(t)] =$	Speed =

Projectile position function for an initial velocity $\mathbf{v}_0$ and an initial position $\mathbf{r}_0$: $\mathbf{r}(t) =$	The arc length of C: s =
The unit tangent vector: $\mathbf{T}(t) =$	The arc length function on C: s(t) =
Principle unit normal vector: $\mathbf{N}(t) =$	The curvature for C given by the arc length parameterization $\mathbf{r}(s)$: K =
Acceleration as a linear combination of **T** and **N**:	The curvature for C given by $\mathbf{r}(t)$: K =
The tangential component of acceleration: $a_{\mathbf{T}} =$	Acceleration in terms of speed (ds/dt) and curvature:
The normal or centripetal component of acceleration: $a_{\mathbf{N}} =$	A vector orthogonal to the unit vector $x(t)\mathbf{i} + y(t)\mathbf{j}$: