M252 Practice Exam 3—Formula Recitation Section

<u>Chapter 11 Formulas</u>

Let $P=(x_0,y_0,z_0)$ and $Q=(x_1,y_1,z_1)$ be points in 3-Space; $\mathbf{u} = \langle u_1,u_2,u_3\rangle$, $\mathbf{v} = \langle v_1,v_2,v_3\rangle$, $\mathbf{w} = \langle w_1,w_2,w_3\rangle$, $\mathbf{n} = \langle a,b,c\rangle$, $\mathbf{n}_1$, and $\mathbf{n}_2$ 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 12 Formulas

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

Give the formulas for the following:

r(t) is continuous at the point t = a:	D_t [**r**(f(t))] =
The derivative of **r**(t):	If **r**(t) · **r**(t) = constant then
D_t [**r**(t) + **u**(t)] =	$\int \vec{r}(t)dt =$
D_t [**r**(t) · **u**(t)] =	Velocity: **v**(t) =
D_t [**r**(t) × **u**(t)] =	Acceleration: **a**(t) =
D_t [f(t)**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 $x(t)\mathbf{i} + y(t)\mathbf{j}$: