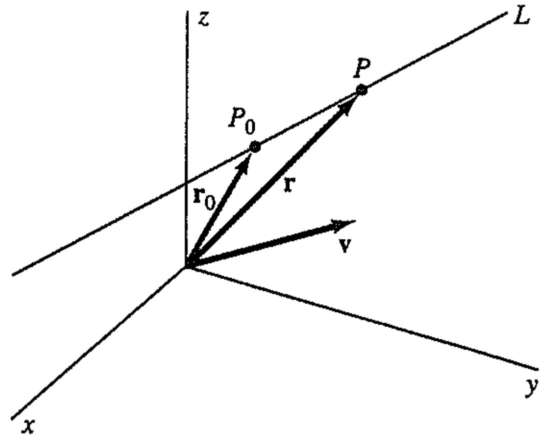
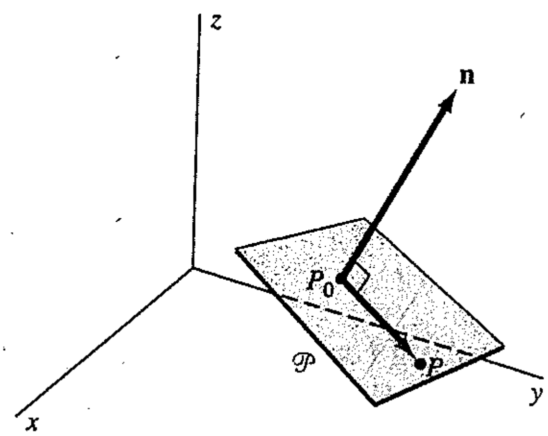


FINN PARAMETERFREMSTILLINGEN AV LINJA SOM PASSERER GJENNOM $P(0,1,3)$ OG $Q(-1,-2,5)$.

FINN LIKNINGENE FOR LINJA GJENNOM PUNKTENE $P_0(1,3,-2)$ OG $P_1(1,-4,2)$. FINN OGSÅ HVOR LINJENE SKJÆRER KOORDINATAKSENE.



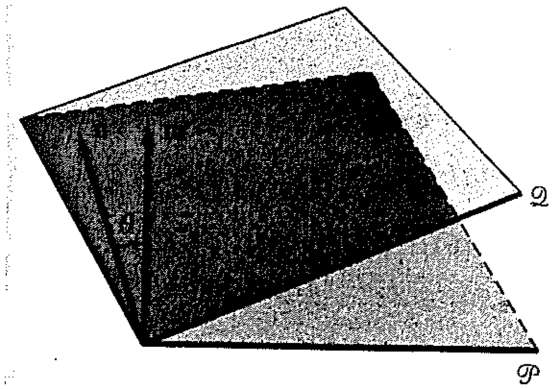
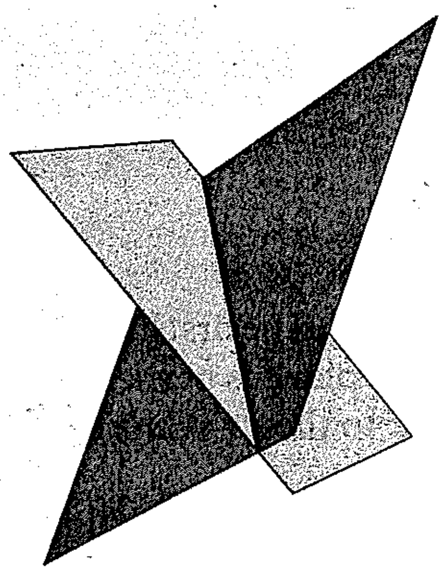
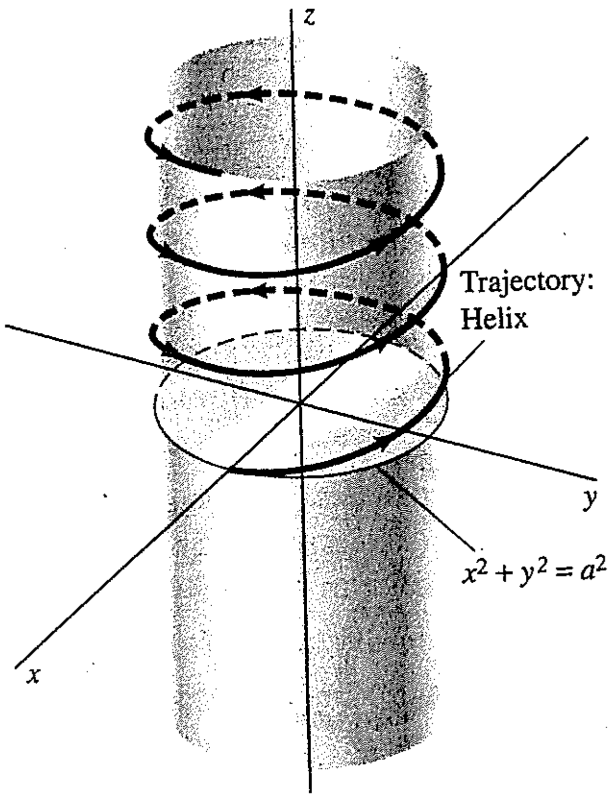


FIGURE 12.4.8 Vectors **m** and **n** normal to the planes $\mathcal{P}$ and $\mathcal{Q}$, respectively.





THEOREM 1 Componentwise Differentiation

Suppose that

$$\mathbf{r}(t) = \langle f(t), g(t), h(t)\rangle = f(t)\mathbf{i} + g(t)\mathbf{j} + h(t)\mathbf{k},$$

where f, g, and h are differentiable functions. Then

$$\mathbf{r}'(t) = \langle f'(t), g'(t), h'(t)\rangle = f'(t)\mathbf{i} + g'(t)\mathbf{j} + h'(t)\mathbf{k}.$$

That is, if $\mathbf{r} = x\mathbf{i} + y\mathbf{j} + z\mathbf{k}$, then

$$\frac{d\mathbf{r}}{dt} = \frac{dx}{dt}\mathbf{i} + \frac{dy}{dt}\mathbf{j} + \frac{dz}{dt}\mathbf{k}.$$

THEOREM 2 Differentiation Formulas

Let $\mathbf{u}(t)$ and $\mathbf{v}(t)$ be differentiable vector-valued functions. Let $h(t)$ be a differentiable real-valued function and let c be a (constant) scalar. Then

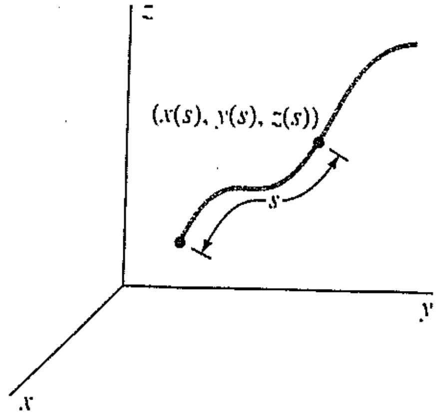
1. $D_t[\mathbf{u}(t) + \mathbf{v}(t)] = \mathbf{u}'(t) + \mathbf{v}'(t)$,
2. $D_t[c\mathbf{u}(t)] = c\mathbf{u}'(t)$,
3. $D_t[h(t)\mathbf{u}(t)] = h'(t)\mathbf{u}(t) + h(t)\mathbf{u}'(t)$,
4. $D_t[\mathbf{u}(t) \cdot \mathbf{v}(t)] = \mathbf{u}'(t) \cdot \mathbf{v}(t) + \mathbf{u}(t) \cdot \mathbf{v}'(t)$, and
5. $D_t[\mathbf{u}(t) \times \mathbf{v}(t)] = \mathbf{u}'(t) \times \mathbf{v}(t) + \mathbf{u}(t) \times \mathbf{v}'(t)$.

EN PARTIKKEL BEVEGER SEG LANGS $y = x^3$. FINN HASTIGHET, AKSELERASJON, SKARLAR HASTIGHET OG SKARLAR AKSELERASJON NÅR $x = 1$.

$$\int_a^b \mathbf{r}(t)\,dt = \mathbf{i}\left(\int_a^b f(t)\,dt\right) + \mathbf{j}\left(\int_a^b g(t)\,dt\right) = \mathbf{i}\Big[F(t)\Big]_a^b + \mathbf{j}\Big[G(t)\Big]_a^b$$
$$= [F(b)\mathbf{i} + G(b)\mathbf{j}] - [F(a)\mathbf{i} + G(a)\mathbf{j}].$$

$$\int_a^b \mathbf{r}(t)\,dt = \Big[\mathbf{R}(t)\Big]_a^b = \mathbf{R}(b) - \mathbf{R}(a),$$

$$\int \mathbf{r}(t)\,dt = \mathbf{R}(t) + \mathbf{C} \quad \text{if} \quad \mathbf{R}'(t) = \mathbf{r}(t),$$



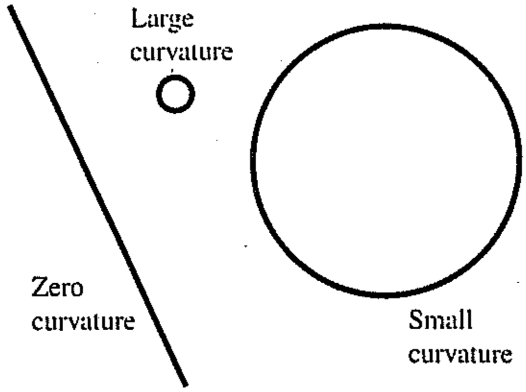
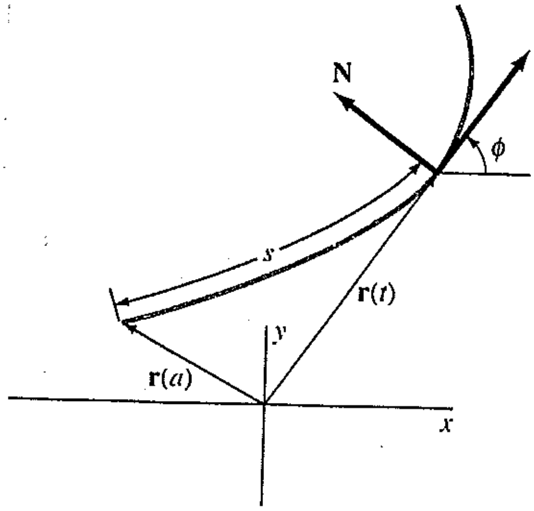


FIGURE 12.6.2 A curve parametrized by arc length s.



$$\kappa = \frac{|x'y'' - x''y'|}{[(x')^2 + (y')^2]^{3/2}} = \frac{|x'y'' - x''y'|}{v^3}$$

$$\kappa = \frac{|y''|}{[1 + (y')^2]^{3/2}} = \frac{|d^2y/dx^2|}{[1 + (dy/dx)^2]^{3/2}}$$

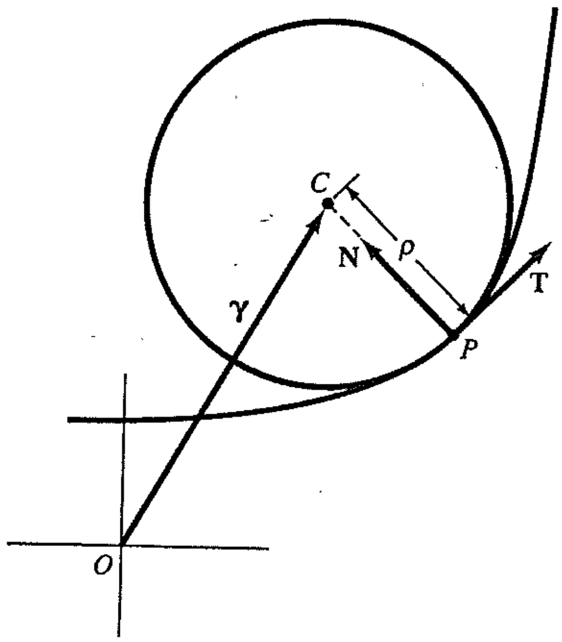
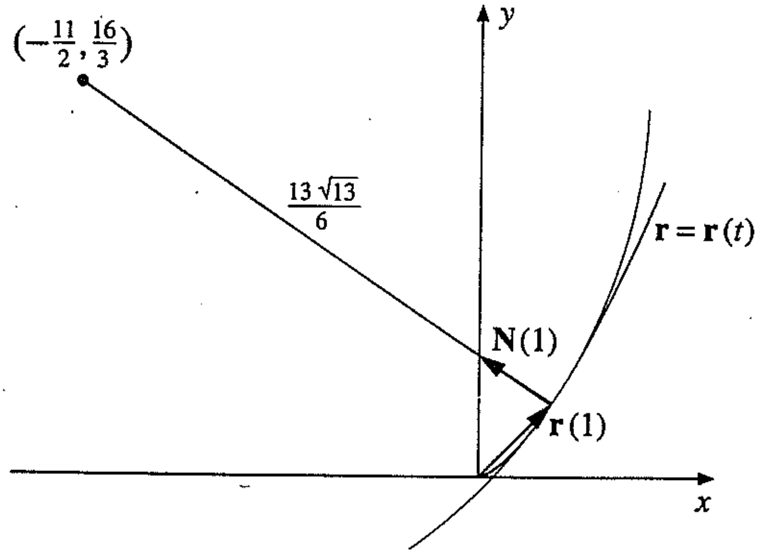


FIGURE 12.6.6 Osculating circle, radius of curvature, and center of curvature.

FINN $\bar{T}$, $\bar{N}$, κ, $\bar{\gamma}$ AV DEN PLANE KURVEN $\bar{r} = \langle t^2, t^3 \rangle$ I PUNKTET (1.1).

FINN OGSÅ KRUMNINGSSIRKELEN.



Figur 8.5.4

Figur 8.5.4 viser litt av kurven og smygsirkelen.

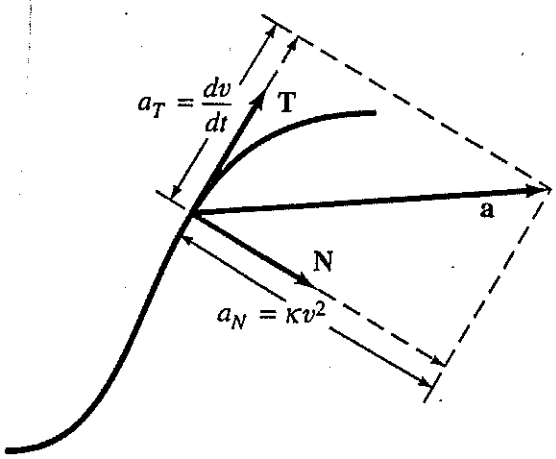
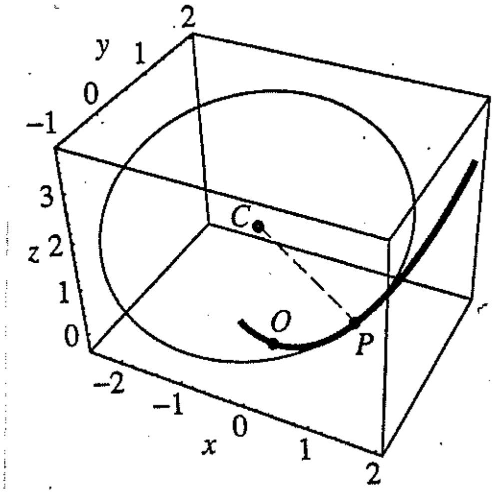


FIGURE 12.6.9 Resolution of the acceleration vector **a** into its tangential and normal components.

FINN KURVASJONSSIRKELEN TIL KURVEN $\bar{r} = \langle t, \frac{1}{2}t^2, \frac{1}{3}t^3 \rangle$ I PUNKTET $(1, \frac{1}{2}, \frac{1}{3})$.



$$\mathbf{u}_r = \mathbf{i}\cos\theta + \mathbf{j}\sin\theta, \qquad \mathbf{u}_\theta = -\mathbf{i}\sin\theta + \mathbf{j}\cos\theta$$

$$\mathbf{v} = \mathbf{u}_r \frac{dr}{dt} + r\frac{d\theta}{dt}\mathbf{u}_\theta$$

$$\mathbf{a} = \left[\frac{d^2r}{dt^2} - r\left(\frac{d\theta}{dt}\right)^2\right]\mathbf{u}_r + \left[\frac{1}{r}\frac{d}{dt}\left(r^2\frac{d\theta}{dt}\right)\right]\mathbf{u}_\theta$$