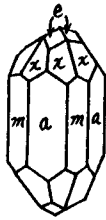
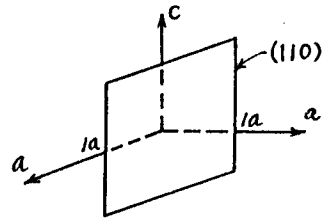


1. 一山線通過(1,2), (2,4)及(5,3)三點, 利用Lagrange內插法求通過此三點之二次式。(15分)
2. 錯英石屬正方晶系(tetragonal system)之礦物, 其單位晶室之大小為  $a = 6.60 \text{ \AA}$ ,  $c = 5.98 \text{ \AA}$ 。參考下圖, 求晶面a(100)與e(101)及e(101)與x(211)之夾角。(20分)  
註: 晶面是以密勒指數(Miller index)表示, 其定義如下



截距	1a	1a	$\infty c$
倒數	1	1	1/ $\infty$
密勒指數	1	1	0

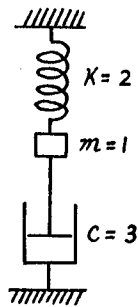


3. 在一力場內, 一單位質量質點所受之力為

$$\vec{F} = -\frac{x}{(\sqrt{x^2 + y^2})^3} \vec{i} - \frac{y}{(\sqrt{x^2 + y^2})^3} \vec{j}$$

求此質點沿第一象限中的橢圓  $\frac{x^2}{4} + y^2 = 1$  自(2,0)至(0,1)運動過程中,  $\vec{F}$  對此質點所作之功。(15分)

4. 求曲面  $z = xy$  在圓柱  $x^2 + y^2 = 1$  中的面積。(15分)
5. 求二次曲面  $x^2 + 4y^2 + 4z^2 + 4xy + 4xz + 6yz = 1$  之主軸方程式, 並求主軸方向, 此二次曲面屬何種圖形?(15分)
6. 下圖為一阻尼系統, 在時間為 1 時, 物體受到一瞬間強烈之重擊(此重擊可以用 Dirac 之 Delta 函數代表), 求此物體的位移變化並繪圖(在時間為 0 時, 物體的位移及速度均為 0)。(20分)



(背面仍有題目, 請繼續作答)

備用公式：

$$\int \sin^2 x \, dx = \frac{x}{2} - \frac{\sin 2x}{4} = \frac{x}{2} - \frac{\sin x \cos x}{2}$$

$$\int \sin^3 x \, dx = \frac{\cos^3 x}{3} - \cos x$$

$$\int \sin^4 x \, dx = \frac{3x}{8} - \frac{\sin 2x}{4} + \frac{\sin 4x}{32}$$

$$\int \sin^5 x \, dx = -\frac{5 \cos x}{8} + \frac{5 \cos 3x}{48} - \frac{\cos 5x}{80}$$

$$\int \sin^6 x \, dx = \frac{5x}{16} - \frac{15 \sin 2x}{64} + \frac{3 \sin 4x}{64} - \frac{\sin 6x}{192}$$

$$\int \sin^7 x \, dx = -\frac{35 \cos x}{64} + \frac{7 \cos 3x}{64} - \frac{7 \cos 5x}{320} + \frac{\cos 7x}{448}$$

$$\int x \sin x \, dx = \sin x - x \cos x$$

$$\int x^2 \sin x \, dx = 2x \sin x - (x^2 - 2) \cos x$$

$$\int x^3 \sin x \, dx = (3x^2 - 6) \sin x - (x^3 - 6x) \cos x$$

$$\int x^4 \sin x \, dx = (4x^3 - 24x) \sin x - (x^4 - 12x^2 + 24) \cos x$$

$$\int \sqrt{x^2 \pm a^2} \, dx = \frac{1}{2} [x\sqrt{x^2 \pm a^2} \pm a^2 \log(x + \sqrt{x^2 \pm a^2})]$$

$$\int \sqrt{a^2 - x^2} \, dx = \frac{1}{2} \left( x\sqrt{a^2 - x^2} + a^2 \sin^{-1} \frac{x}{a} \right)$$

$$\int \frac{dx}{\sqrt{x^2 + a^2}} = \log(x + \sqrt{x^2 + a^2}), \quad \text{or} \quad \sinh^{-1} \frac{x}{a}$$

$$\int \frac{dx}{\sqrt{x^2 - a^2}} = \log(x + \sqrt{x^2 - a^2}), \quad \text{or} \quad \cosh^{-1} \frac{x}{a}$$

$$\int \cos^2 x \, dx = \frac{x}{2} + \frac{\sin 2x}{4} = \frac{x}{2} + \frac{\sin x \cos x}{2}$$

$$\int \cos^3 x \, dx = \sin x - \frac{\sin^3 x}{3}$$

$$\int \cos^4 x \, dx = \frac{3x}{8} + \frac{\sin 2x}{4} + \frac{\sin 4x}{32}$$

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$$\int \cos^6 x \, dx = \frac{5x}{16} + \frac{15 \sin 2x}{64} + \frac{3 \sin 4x}{64} + \frac{\sin 6x}{192}$$

$$\int \cos^7 x \, dx = \frac{35 \sin x}{64} + \frac{7 \sin 3x}{64} + \frac{7 \sin 5x}{320} + \frac{\sin 7x}{448}$$

$$\int x \cos x \, dx = \cos x + x \sin x$$

$$\int x^2 \cos x \, dx = 2x \cos x + (x^2 - 2) \sin x$$

$$\int x^3 \cos x \, dx = (3x^2 - 6) \cos x + (x^3 - 6x) \sin x$$

$$\int x^4 \cos x \, dx = (4x^3 - 24x) \cos x + (x^4 - 12x^2 + 24) \sin x$$

$F(s) = \mathcal{L}\{f(t)\}$	$f(t)$
$\frac{s}{(s^2 + \omega^2)^2}$	$\frac{t}{2\omega} \sin \omega t$
$\frac{s^2}{(s^2 + \omega^2)^2}$	$\frac{1}{2\omega} (\sin \omega t + \omega t \cos \omega t)$
$\frac{s}{(s^2 + a^2)(s^2 + b^2)} \quad (a^2 \neq b^2)$	$\frac{1}{b^2 - a^2} (\cos at - \cos bt)$
$e^{-as}/s$	$u(t - a)$
$e^{-as}$	$\delta(t - a)$