If satisfies 0 = \( (\lambda', \gamma') \mathcal{C}_x \mathcal{P} \) for \( (\lambda', \gamma') \mathcal{C}_x \mathcal{P} \).

\[
\begin{align*}
\text{for } & \quad \lambda > 1 \quad \text{for } \quad 0 = \\
\text{for } & \quad \lambda < 1 \quad \text{for } \quad \left[ (\lambda - 1) \right] \frac{\sin \theta}{\gamma} = (\lambda', \gamma') \mathcal{C}_x \mathcal{P}
\end{align*}
\]

Useful information: The Green's function for the equation is 0 = \( \kappa_x \mathcal{P} + \frac{\gamma_x \mathcal{P}}{\lambda_x \mathcal{P}} \).

1. Write the equation for the function \( X(x, \lambda) \).

2. Solve the equation for \( \lambda \) with \( \lambda \) at the source.

3. Assuming a simple separation of variables, form the differential equation for \( \lambda \).

4. Write the Lagrangian for a string of mass per unit length \( \sigma \) and tension \( T \).

5. Write Newton's second law applied to an infinitesimal piece of string.

6. State the equation of motion obtained in part (a).

\[
\begin{align*}
\text{where } \gamma & \text{ is the transverse displacement of the string.}
\end{align*}
\]

7. Write the Lagrangian for a string of length \( L \) with mass per unit length \( m \) and tension \( T \).

8. For time \( t \) from \( 0 \) to \( x = L \). The tension is set at its two ends along the ends of the string.

9. A uniform string of length \( L \) is tied at its two ends along the x-axis and stretches.

Problem 1 (Mechanics)
\[ L = \int_{x_1}^{x_2} \sqrt{1 + \left( \frac{dy}{dx} \right)^2} \, dx \]

\[ \phi_y = \frac{r_y}{r} \]

\[ \text{Forden} \]

\[ \left( \phi_y - \phi_y \right) \]

\[ \frac{1}{2} \int_{x_1}^{x_2} \phi_y \, dx \]

\[ L = \frac{1}{2} \int_{x_1}^{x_2} \phi_y \, dx \]

\[ \int_{x_1}^{x_2} \phi_y \, dx = \int_{x_1}^{x_2} \phi_y \, dx \]

\[ \int_{x_1}^{x_2} \phi_y \, dx = \int_{x_1}^{x_2} \phi_y \, dx \]

\[ \therefore \]

\[ \text{Problem 34} \]

\[ \text{Macnamara} \]
\[ 0 = (x) X_{2}\alpha + (x)_{11} X. \]

Centroid

\[ \chi_{z} = \frac{(t) \chi}{\partial} = \frac{(x)}{(x)_{11}} \]

\[ (t)_{11} X_{2} = (t) \chi (x)_{11} X \]

\[ \int_{\chi} \rho = \int_{\chi} \frac{(t)_{11}}{(t)} \rho \]

Plug (4) into (6)

\[ \int_{\chi_{z}} \rho \]

\[ \rho_{\text{app}} = \rho \]

\[ \frac{\partial x}{\partial y} \rho (x \rho dx) = \frac{x x_{2}}{y_{2}} \frac{dx}{dy} \]

Foe wuenvado
\[ y(t) = \text{sum ut} + \int_{t_0}^{\infty} e^{\alpha t} G(t, t') \left( -\omega_0^2 s(t') \right) dt' \]

for \( t > t_0 \) and \( G(t, t') = 0 \) for \( t < t' \).

If \( p ) = 0 \) \( \omega_0^2 s(t') \right) dt' \]

In particular, choose to make

\[ y(t) = \text{sum ut} \quad \forall \ t > 0 \]

\[ y''(t) + \omega_0^2 y(t) = -\omega_0^2 s(t) \]

\[ y(0) = 0 \]

\[ y'(0) = \frac{1}{\omega_0^2} \left( \frac{7}{11} \right) \]

\[ (\frac{7}{11}) \frac{\sin (\frac{1}{11})}{x(0)} = A \sin \left( \frac{7}{11} \right) \]

\[ a = \begin{cases} \frac{7}{11} & \text{if } (t) < \frac{1}{11} \\ \frac{7}{11} & \text{otherwise} \end{cases} \]

Some solutions can meet some not jump mode

\[ a(t) = 0 \]

\[ x(0) = x(1) = 0 \]

\[ \text{we have for } \delta \]
\[ Y(t) = \sum_{n=-\infty}^{\infty} e^{j\omega_n t} \cos \omega_n t \]

\[ Y(t) = \sum_{n=-\infty}^{\infty} \left( e^{j\omega_n t} \cos \omega_n t + e^{-j\omega_n t} \cos \omega_n t \right) \]

\[ \text{This is the zeroth order.} \]

\[ Y(t) = \sum_{n=-\infty}^{\infty} \left( e^{j\omega_n t} \cos \omega_n t - e^{-j\omega_n t} \cos \omega_n t \right) \]

\[ \text{This is the first order.} \]
where, 's' denotes space fixed coordinates, and 'q' denotes body fixed coordinates.

\[ \mathbf{I} = \mathbf{I}^{(s)} + \mathbf{I}^{(q)} \]

Useful information:
- In terms of \( \mathbf{I} \) and the magnitude \( I \) of \( \mathbf{I} \), find the angular frequency \( \omega \) for the rotation of \( \mathbf{I} \) around \( \mathbf{I} \). Give your answer in terms of \( \mathbf{I} \) and \( I \).

(c) Find the half angle \( \theta \) of the space cone in terms of \( a \) and \( \theta \).

(d) Find the half angle \( \theta \) of the body cone is \( a \) and the half angle \( \theta \) of the space cone is \( \theta \) (see figure).

(e) Find the angular momentum vector \( \mathbf{L} \) at \( t = 0 \) in this basis.

(f) Assume that this vector lies in the \( t \) plane at \( t = 0 \).

(g) Write the angular velocity vector \( \mathbf{\omega} \) at \( t = 0 \) using the unit vectors \( \mathbf{\hat{e}}_1 \) and \( \mathbf{\hat{e}}_2 \). The moment of inertia are \( I_1 \) and \( I_2 \), where \( I = I_1 + I_2 \) and \( I = \mathbf{I} \) are the moments of inertia about the body and the space axes, respectively.

(h) Consider a prolate spheroid with no external forces acting on it. At \( t = 0 \) the body axes, such that the unit vector \( \mathbf{\hat{e}}_3 \) points along the symmetry axis of the spheroid.
\[
\begin{align*}
\text{From } \beta &= \frac{1}{1 - \tan a} \text{ and } \frac{\cos a}{\sin a},
\end{align*}
\]

For \( P \) be the angle from \( L \) to \( \tilde{L} \).

\[
\begin{pmatrix}
1 - \cos a & \sin a \\
-\sin a & \cos a
\end{pmatrix}
\begin{pmatrix}
1 \\
0
\end{pmatrix}
= \begin{pmatrix}
1 \\
0
\end{pmatrix}
\]

\[
\begin{align*}
\cos a + \sin a \eta &= M = \mu (\mu - a)
\end{align*}
\]

\[
\begin{align*}
\mathbf{L} &\rightarrow \mathbf{L} \\
\mathbf{L} &\rightarrow \mathbf{L} \\
\mathbf{L} &\rightarrow \mathbf{L}
\end{align*}
\]

\[
I - \begin{pmatrix}
1 - \cos a & \sin a \\
-\sin a & \cos a
\end{pmatrix}
= \mathbf{II}
\]

\[
\begin{align*}
I &= \frac{\mu}{1 - \cos a} \\
I &= \frac{1}{2} \frac{\mu}{1 - \cos a}
\end{align*}
\]
\[ 0 = (\cos \omega + m \omega^2)(\omega \cos \theta) \]

\[ 0 = (\sin \omega + m \omega^2)(\omega \sin \theta) \]

\[ I_3 - I_2 = 0 \]

\[ I_3 = I_2 \]

\[ = I 1 \]

\[ = I 1 \]

\[ = I 1 \]

\[ \cos \theta = m \omega \]

\[ \sin \theta = m \omega \]

\[ 0 = (\cos \omega + m \omega^2)(\omega \cos \theta) \]

\[ 0 = (\sin \omega + m \omega^2)(\omega \sin \theta) \]

\[ 0 = (\omega \omega + m \omega^2)(\omega \omega + m \omega^2) \]

\[ 0 = (\omega \cos \theta + m \omega^2)(\omega \sin \theta + m \omega^2) \]

\[ \text{body axis} \]

\[ \frac{d}{dt} \left( \begin{array}{c} x \\ y \\ z \end{array} \right) = 0 \]

\[ \frac{d}{dt} \left( \begin{array}{c} x \\ y \\ z \end{array} \right) = 0 = \omega \times m \omega + \frac{dt}{dt} \]
The angular frequency $\omega$ is

$$\omega = \frac{\theta}{\text{time}}$$

\[ \begin{align*}
\omega_1 &= \frac{\theta_1}{\text{time}} \\
\omega_2 &= \frac{\theta_2}{\text{time}} \\
\omega_3 &= \frac{\theta_3}{\text{time}}
\end{align*} \]

The angular frequency $\omega$ is given by

$$\omega = \left( \frac{\theta}{\text{time}} \right)$$

\[ \begin{align*}
\omega_1 &= \left( \theta_1 \right) \\
\omega_2 &= \left( \theta_2 \right) \\
\omega_3 &= \left( \theta_3 \right)
\end{align*} \]
\[
\frac{1}{\frac{1}{\text{m} \cdot I}} = \frac{1/\text{m}}{\frac{1}{\text{m} \cdot I}} = \frac{1}{\text{m} \cdot I} = \frac{1}{\text{m}} \frac{1}{\text{I}}
\]

\[
\frac{\text{sum} \cdot \text{m}}{\text{sum} \cdot \text{m}} = \frac{1}{\text{m} \cdot \text{I}} = \frac{1}{\text{m} \cdot \text{I}}
\]
In cylindrical coordinates:

\[
\frac{d\rho}{\partial t} = \Delta \times \mathbf{E} = \mathbf{B} \\
\frac{d\phi}{\partial t} = -\phi \Delta - \mathbf{E} \\
\frac{dz}{\partial t} = \mathbf{B} \times \mathbf{E} = 0
\]

Useful Formulas:

1. Find the electric field \( \mathbf{E}(r, t) \). What is its behavior at large times?

2. Find the magnetic field \( \mathbf{B}(r, t) \). Consider the observer at \( z = 0 \).

3. What is the vector potential \( \mathbf{A}(r, t) \) for this current? Use the retarded Green's functions and evaluate all integrals. Hint: \( \mathbf{A} = \mathbf{V}_r' \).

4. Express the current density \( j(r, t) \) using \( \delta \)-functions and step functions.

5. For all \( t \geq 0 \), the positive ions cancel the charge of the moving electrons. There is no charge density for all \( t \geq 0 \) in the positive z-direction. As in ordinary wires, where the current is limited long wires on the z-axis has no current for \( t > 0 \) and a constant current for \( t > 0 \).
\[ \frac{\partial^2}{\partial z^2} - \frac{1}{c^2} \frac{\partial^2}{\partial t^2} \]

\[ A(z,t) + \left( \int \frac{c}{1 + \frac{z^2}{c^2}} \frac{1}{1 + \frac{z^2}{c^2}} \right) \frac{\partial}{\partial t} \int \frac{c}{1 + \frac{z^2}{c^2}} \frac{1}{1 + \frac{z^2}{c^2}} \]

\[ A(z,t) = \int \frac{c}{1 + \frac{z^2}{c^2}} \frac{1}{1 + \frac{z^2}{c^2}} \]

\[ \frac{\partial}{\partial t} \left( \frac{\partial}{\partial t} \right) - \frac{1}{c^2} \frac{\partial^2}{\partial z^2} \]

\[ I(\frac{\partial}{\partial t} \Theta(0) \Theta(t)) \int \frac{c}{1 + \frac{z^2}{c^2}} \frac{1}{1 + \frac{z^2}{c^2}} \]

\[ \begin{cases} 0 & t < 0 \\ 0 & t > 0 \\ I \frac{\partial}{\partial t} \Theta(0) \Theta(t) & t = 0 \end{cases} \]

\[ \frac{\partial}{\partial t} \left( \frac{\partial}{\partial t} \right) - \frac{1}{c^2} \frac{\partial^2}{\partial z^2} \]

\[ \text{Initial and boundary conditions} \]

\[ \text{Problem 12.4.34} \]

\[ \text{Electromagnetism Problem 1} \]
For a fixed $p$ consider also a fixed time $t$

If $t < \frac{p}{c}$, $A_z(p, t) = 0$, since $t' < t - \frac{p}{c} < 0$ and at $t' < 0$ there is no current on the wire.

$t > \frac{p}{c}$; we must integrate on the wire from $-z'$ to $z'$

where $\sqrt{z'^2 + p^2} = ct$ (This makes $t'$ positive)

$$A_z(p, t) = \frac{I}{c} \int_{-z'}^{z'} d\zeta \frac{1}{\sqrt{p^2 + \zeta^2}}$$

$$= \frac{I}{c} \int_{-\zeta'/p}^{\zeta'/p} dx \frac{1}{\sqrt{1 + x^2}}$$

$$= \frac{2I}{c} \sinh^{-1} \left( \frac{\zeta'}{p} \right)$$

$$A_z(p, t) = \frac{2I}{c} \sinh^{-1} \left( \frac{\sqrt{c^2t^2 - p^2}}{p} \right) \quad t > \frac{p}{c}$$
\[
\frac{z}{2} \frac{\partial}{\partial t} \frac{\partial}{\partial z} \phi = \frac{\partial}{\partial z} \left( \gamma \frac{\partial}{\partial t} \phi \right) - \frac{\gamma}{2} \frac{\partial^2}{\partial z^2} \phi - \frac{\gamma}{2} \frac{\partial}{\partial t} \left( \frac{c_t}{\gamma} \right) \frac{\partial}{\partial z} \phi = \frac{\partial}{\partial z} \left[ \frac{\gamma}{2} \frac{\partial}{\partial t} \phi \right]
\]

\[
\frac{c_t^2}{\gamma} \frac{\partial}{\partial t} \phi = \frac{\partial}{\partial z} \left( \gamma \frac{\partial}{\partial t} \phi \right) - \frac{\gamma}{2} \frac{\partial^2}{\partial z^2} \phi - \frac{\gamma}{2} \frac{\partial}{\partial t} \left( \frac{c_t}{\gamma} \right) \frac{\partial}{\partial z} \phi = \frac{\partial}{\partial z} \left[ \frac{\gamma}{2} \frac{\partial}{\partial t} \phi \right]
\]

\[
\phi = \frac{d_e}{\varepsilon} \frac{\partial}{\partial z} \phi = \frac{d_e}{\varepsilon} \frac{\partial}{\partial z} \left( \frac{\gamma}{2} \frac{\partial}{\partial t} \phi \right) - \frac{\gamma}{2} \frac{\partial^2}{\partial z^2} \phi - \frac{\gamma}{2} \frac{\partial}{\partial t} \left( \frac{c_t}{\gamma} \right) \frac{\partial}{\partial z} \phi = \frac{\partial}{\partial z} \left[ \frac{\gamma}{2} \frac{\partial}{\partial t} \phi \right]
\]

\[
\left( \frac{d_e}{\varepsilon} \right) \frac{\partial}{\partial z} \phi = \frac{d_e}{\varepsilon} \frac{\partial}{\partial z} \left( \frac{\gamma}{2} \frac{\partial}{\partial t} \phi \right) - \frac{\gamma}{2} \frac{\partial^2}{\partial z^2} \phi - \frac{\gamma}{2} \frac{\partial}{\partial t} \left( \frac{c_t}{\gamma} \right) \frac{\partial}{\partial z} \phi = \frac{\partial}{\partial z} \left[ \frac{\gamma}{2} \frac{\partial}{\partial t} \phi \right]
\]

\[
\frac{d_e}{\varepsilon} \phi = \frac{\partial}{\partial z} \phi = \frac{d_e}{\varepsilon} \frac{\partial}{\partial z} \left( \frac{\gamma}{2} \frac{\partial}{\partial t} \phi \right) - \frac{\gamma}{2} \frac{\partial^2}{\partial z^2} \phi - \frac{\gamma}{2} \frac{\partial}{\partial t} \left( \frac{c_t}{\gamma} \right) \frac{\partial}{\partial z} \phi = \frac{\partial}{\partial z} \left[ \frac{\gamma}{2} \frac{\partial}{\partial t} \phi \right]
\]

\[
\frac{d_e}{\varepsilon} \phi = \frac{\partial}{\partial z} \phi = \frac{d_e}{\varepsilon} \frac{\partial}{\partial z} \left( \frac{\gamma}{2} \frac{\partial}{\partial t} \phi \right) - \frac{\gamma}{2} \frac{\partial^2}{\partial z^2} \phi - \frac{\gamma}{2} \frac{\partial}{\partial t} \left( \frac{c_t}{\gamma} \right) \frac{\partial}{\partial z} \phi = \frac{\partial}{\partial z} \left[ \frac{\gamma}{2} \frac{\partial}{\partial t} \phi \right]
\]

Find the mass flow.
\[
\phi(0, t) = B_0 \int \frac{1 - \left(\frac{ct}{\gamma} \right)^2}{\frac{c^2}{2\pi}}
\]
(5) \[ \varepsilon_0 \mu_0 E^2 = (\mu_0)^2 B^2 \]

\[ \varepsilon_0 \mu_0 E^2 = (\mu_0)^2 B^2 \]

Assume now that the fields in the conductor are of the form

\[ 0 = (\mu_0)^2 B \left\{ \left( \frac{\varepsilon}{\varepsilon_0} \right)^{1/2} + 1 \right\} \]

for the conducting media. Use \( \varepsilon = \varepsilon_0 \), and show that the differential equation for the time-independent fields \( B^2, E^2 \) in the conductor Maxwell's equations for the time-independent fields \( E^2, B^2 \) is a constraint to be found.

(4) Propagating in the \((+z)\) direction, the \( E \) is a constant to be found.

\[ \left\{ \begin{array}{l}
\varepsilon_0 \mu_0 (\mu_0 \varepsilon)^{1/2} E \Rightarrow (z, t, 0) \varepsilon_0 \mu_0 E
\end{array} \right. \]

(3) The incident wave (for \( z > 0 \)) is of the form with \( k = \frac{\omega}{c} \) and \( \phi \) a real constant.

\[ \left\{ \begin{array}{l}
\varepsilon_0 \mu_0 (\mu_0 \varepsilon)^{1/2} E \Rightarrow (z, t, 0) \varepsilon_0 \mu_0 E
\end{array} \right. \]

The incident field (for \( z > 0 \)) is of the form.

(2) The conductor \((z < 0)\) and \( \phi \) a real constant.

\[ \left\{ \begin{array}{l}
\varepsilon_0 \mu_0 (\mu_0 \varepsilon)^{1/2} E \Rightarrow (z, t, 0) \varepsilon_0 \mu_0 E
\end{array} \right. \]

Problem 2 (Electromagnetism)
\[
\left( \left( \left| \frac{\partial \bar{I}}{\partial x} \right| + \left| \frac{\partial \bar{I}}{\partial y} \right| \right) \frac{\bar{I}}{I} \right) \left( \left| \frac{\partial \bar{I}}{\partial x} \right| + \left| \frac{\partial \bar{I}}{\partial y} \right| \right) \frac{\bar{I}}{I} = \Omega L
\]

\[
\frac{\bar{I}}{\bar{I}} + \frac{\bar{I}}{\bar{I}} = \bar{I} \times \Delta
\]

\[
\bar{I} \Delta - (\bar{I} \cdot \Delta) \Delta = (\bar{I} \times \Delta) \times \Delta
\]

**Useful Information:**

- Answer in terms of \( \mathcal{E} \) and \( \mathcal{G} \).
- Draw a sketch showing the surface you will use.
- Express your radiation (draw a sketch showing the surface you will use) and the pressure on the conductive well due to the stress-tensor \( \mathcal{T} \).
- What are the relevant boundary conditions for \( \mathcal{E} \) and \( \mathcal{G} \) at the boundary?
The lower bound on the dual gap is:

\[ r = \frac{r_{\text{min}}}{1 + \frac{m}{r_{\text{min}}}} \]

From (1):

\[ \frac{r_{\text{min}}}{1 + \frac{m}{r_{\text{min}}}} = r \]

And:

\[ \frac{r_{\text{min}}}{1 + \frac{m}{r_{\text{min}}}} = r \]

Thus:

\[ r_{\text{min}} = \frac{r}{1 + \frac{m}{r}} \]

Let:

\[ \Delta = r_{\text{min}} \]

Also:

\[ B = \frac{r_{\text{min}}}{1 + \frac{m}{r_{\text{min}}}} \]

The lower bound on the dual gap is:

\[ \Delta \leq \frac{r_{\text{min}}}{1 + \frac{m}{r_{\text{min}}}} \]
\[ E_F = \frac{n + \frac{1}{\mu}}{n - \frac{1}{\mu}} E_0 \]

\[ E_C = \frac{E_C - E_0}{2} = \frac{E_C + E_0}{2} \]

\[ 2E_0 = (1 + \frac{a}{b}) E_C \]

\[ E_0 - E_F = \frac{a}{b} E_0 \] (f)

\[ E_0 + E_F = E_C \] (c)

Add:

\[ E \text{ and continuous at } z = 0 \]

\[ \int E \cdot dl = \int E \cdot dA = 0 \]

\[ \int E \cdot dA = 0 \text{ and } E \text{ and continuous} \]

Boundary condition: (d)
\[
\text{Pressure} = \frac{8\pi}{T} \left( E_e^* + \frac{h_b^*}{\beta E_e^*} \right) = \frac{1}{T} \left( E_e + \frac{h_b}{\beta E_e} \right)
\]

\[
B = E_e - E_r = \frac{h_b}{\beta E_e}
\]

\[
E = E_e + E_r = \frac{h_b}{\beta E_e}
\]

offset of the wage

\[
\text{Pressure} = \frac{1}{T} \left( (\bar{E}_2 L_2 + \bar{E}_3 L_3) \right)
\]

\[
\frac{\partial p}{\partial n} = -T_{33}
\]

\[
T_{33} = \frac{3E_e^*}{1 - \nu} \left( 3E_e^* + 3\nu B_e^* - \frac{1}{2} (\bar{E}_2 L_2 + \bar{E}_3 L_3) \right)
\]

\[
\text{None 2. component}
\]

\[
\mathbf{u} = \begin{pmatrix} 0 \ 0 \ 1 \end{pmatrix}
\]

\[
\text{Surface}
\]

\[
\text{Boundary condition on the body}
\]

\[
\int \mathbf{n} \cdot \mathbf{p} \, ds = 0
\]

\[
\text{Wedge area}
\]

\[
\text{Foot note}
\]

\[
\text{Foot note}
\]
Problem #1

I. The Dulong equation of state relates the pressure \( p \) of an ideal gas to the temperature \( T \) and specific volume \( v \) by

\[ \frac{N k}{v} = C \]

where \( k \) is a positive constant.

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\[
P(n', \phi') = \frac{p}{2 \alpha^3} \left( 1 - \frac{\alpha^2}{n(n-1)} \right)
\]

\[
\text{Now } \frac{\partial}{\partial \phi} = -\frac{p}{\alpha} \frac{\alpha^2}{n(n-1)}
\]

\[
P(n', \phi') = p + \frac{\alpha^2}{n(n-1)}
\]

\[
\frac{\partial}{\partial x} T + \frac{\partial}{\partial y} (n(x,y) - n) + \frac{\partial}{\partial z} (n(z,y) - n) + \frac{\partial}{\partial \phi} (n(x,y) - n) + \frac{\partial}{\partial \theta} (n(x,y) - n) + \frac{\partial}{\partial \phi} (n(x,y) - n) = 0
\]

\[
\text{At } T = T_c \text{ it appears everywhere is } n_c.
\]

\[
K_c = \frac{c}{2 \alpha^3} \left( T_c^2 - 1 \right)
\]

\[
\frac{\partial}{\partial \epsilon} = \frac{\partial}{\partial T} \left( \frac{c}{2 \alpha^3} \right) = \frac{c}{2 \alpha^3} \frac{\partial}{\partial \epsilon}
\]

\[
\text{Thus the expansion of } \mathcal{F} \text{ is } \frac{c}{2 \alpha^3} \frac{\partial}{\partial \epsilon}
\]

\[
\frac{\partial}{\partial \epsilon} \left( \frac{c}{2 \alpha^3} \right) = \frac{c}{2 \alpha^3} \frac{\partial}{\partial \epsilon}
\]

\[
\text{of } \frac{c}{2 \alpha^3} \text{ is } \frac{\partial}{\partial \epsilon} \left( \frac{c}{2 \alpha^3} \right) = \frac{c}{2 \alpha^3} \frac{\partial}{\partial \epsilon}
\]

\[
(\tan \phi) \text{ and } \frac{\partial}{\partial \epsilon}
\]

\[
\frac{2}{2 \alpha^3} = \frac{9}{2} - \frac{9}{2} \frac{\alpha^2}{n(n-1)}
\]

\[
\frac{2}{2 \alpha^3} = \frac{9}{2} - \frac{9}{2} \frac{\alpha^2}{n(n-1)}
\]

\[
\text{Thus if } \frac{2}{2 \alpha^3} \text{ is } \frac{9}{2} - \frac{9}{2} \frac{\alpha^2}{n(n-1)}
\]

\[
\text{since}
\]

\[
(\tan \phi) \text{ and } \frac{\partial}{\partial \epsilon}
\]

\[
2 \frac{2}{2 \alpha^3} = \frac{9}{2} - \frac{9}{2} \frac{\alpha^2}{n(n-1)}
\]

\[
(\tan \phi) \text{ and } \frac{\partial}{\partial \epsilon}
\]
(d) 
Evaluate the heat capacity \( C \) of this system, using

\[
\frac{\beta C}{\beta} = \int_0^\infty \frac{1 + e^{-\beta x} x^p}{e^{\beta x}} \, dx
\]

where \( \beta = \frac{kT}{\varepsilon} \).

(c) Show that the mean total excitation energy of this system at non-zero temperature satisfies

\[
\frac{\beta}{\beta} = \langle (\varepsilon + E) \rangle = \int_0^\infty E \cdot \left( \frac{\varepsilon + E}{\varepsilon} \right) \cdot \frac{e^{-\beta x}}{x^p} \, dx
\]

(b) What is the chemical potential of this system at \( \beta = 0 \)? Use the result from (a) to show that \( \beta \) does not change with \( T \).

(a) The energy states are occupied and all positive energy states are empty.

Now, for the rest of the problem, assume that the single-particle states come in pairs of

\[
|\psi\rangle = |\varepsilon\rangle \pm
\]

positive and negative energies.

where \( \beta \) is any constant energy

\[
I = \langle (\varepsilon - \varepsilon) u \rangle + \langle (\varepsilon + \varepsilon) u \rangle
\]

\( \varepsilon \) and chemical potential \( \beta \).

2. Consider a system of non-interacting spin 1/2 fermions at temperature \( T \), in volume

Statistical Mechanics: Problem #2

\[ \text{Problem:} \]

\[ \text{Problem:} \]

\[ \text{Problem:} \]

\[ \text{Problem:} \]

\[ \text{Problem:} \]

\[ \text{Problem:} \]
The diagram provided is unclear, but it seems to be related to a mathematical or physical problem. The text appears to be a mix of mathematical expressions and words, but due to the quality of the image, it is not legible. The page contains several equations and symbols, but their specific meaning is not clear from the image.
\[
(\mathcal{H}_m - \hbar \omega)(\frac{\mathbf{\hat{r}}}{\omega}) = \mathbf{\hat{p}}
\]

You may find the following expressions useful:

Find

\[
\frac{\hbar}{\omega \gamma - \mathbf{\hat{r}}} = (u)\mathbf{J}
\]

The particle with energy \( E \) is given by a Poisson distribution. Assume that the particle is in the ground state of the system.

(a) What are the eigenvalues and associated degeneracies for this Hamiltonian?

(b) What is the Hamiltonian for the system?

I. Consider a particle of charge \( e \) and mass \( m \) confined to the \( xy \)-plane and subject to an harmonic oscillator potential and a uniform electric field of magnitude \( \mathcal{E} \) oriented along the positive \( x \)-direction.

Quantum Mechanics: Problem 

I
(a) Particle is in state $|n, \lambda\rangle$ with $\lambda = \frac{\mu}{2}$. Now let $x < 0$. Then we need to calculate only $\lambda = 0$, $m = 0$.

$$\Psi_{c,0} = C \left( \psi_{1,0} + \frac{1}{2} \psi_{1,1} \right).$$

(b) $x = \frac{\lambda^2 + \mu}{2} - \frac{1}{2} \mu^2 - \frac{1}{2} \mu^2.$

$$W_0 = \frac{\lambda^2}{\mu^2} + \frac{\mu^2}{2} \mu^2 - \frac{1}{2} \mu^2.$$
\[
\frac{2m \omega}{g} = \frac{1}{\sqrt{1 - \frac{v^2}{c^2}}}
\]

Let \( m \omega \leq 1 \) and \( v \leq c \).

\[
< \omega > = \frac{1}{T} \int_{-\infty}^{\infty} \omega e^{-\frac{\omega}{T}} d\omega
\]

But \( m = c + m' \).

\[
< \omega > = \frac{1}{T} \int_{-\infty}^{\infty} \omega e^{-\frac{\omega}{T}} d\omega
\]

Now \( \omega < \frac{c}{T} \) and \( \omega \to 0 \) as \( T \to \infty \).

\[
\lim_{T \to \infty} \frac{1}{T} \int_{-\infty}^{\infty} \omega e^{-\frac{\omega}{T}} d\omega = \frac{1}{2} \chi'(0)
\]

where \( \chi(0) = -\frac{1}{2} < \omega > \).
Suppose the Hamiltonian in the problem is given by
\[ H = \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix} \]
and assume that the system consists of three electrons. Initially, the system is in the state \( |\psi_0\rangle = \frac{1}{\sqrt{2}} (|s\rangle + |\bar{s}\rangle) \) where \( |s\rangle \) and \( |\bar{s}\rangle \) are the spin states of the electrons.

2. A molecule consisting of three identical atoms in an equilateral triangle captures a single electron.
What is the only possible answer for $x$? Solve $R^2 = x$. Then, $R = \sqrt{x}$. Use $x = \frac{1}{2}(15\sqrt{3} + 15\sqrt{2} - 15\sqrt{2})$.