



January 29, 2018

Dr. Christopher R.L. Blake  
President  
Middle Georgia State University  
100 University Parkway  
Macon, GA 31206

Dear Dr. Blake:

Thank you for your letter of October 16, 2017, notifying the Commission of the intent to offer the Bachelor of Arts (B.A.) in Contemporary Musicianship effective January 9, 2018. The

program name was verified in an e-mail from Dr. Kevin Cantwell on January 29, 2018. The

introductory program will be offered on the main campus and appropriate approvals were

THE UNIVERSITY OF CHICAGO

PHYSICS DEPARTMENT

PHYS 435

PROBLEM SET 1

1. A particle of mass  $m$  moves in a potential  $V(x) = \frac{1}{2}kx^2$ .

(a) Find the energy levels  $E_n$  and the corresponding wave functions  $\psi_n(x)$  for the ground state and the first excited state.

(b) Calculate the expectation value of the position  $\langle x \rangle$  for the ground state.

2. A particle of mass  $m$  moves in a potential  $V(x) = \frac{1}{2}kx^2 + \frac{1}{4}\alpha x^4$ . Use perturbation theory to find the energy levels  $E_n$  to first order in  $\alpha$ .

3. A particle of mass  $m$  moves in a potential  $V(x) = \frac{1}{2}kx^2 + \frac{1}{4}\alpha x^4 + \frac{1}{6}\beta x^6$ .

Use perturbation theory to find the energy levels  $E_n$  to first order in  $\alpha$  and  $\beta$ .

4. A particle of mass  $m$  moves in a potential  $V(x) = \frac{1}{2}kx^2 + \frac{1}{4}\alpha x^4$ .

Use perturbation theory to find the energy levels  $E_n$  to first order in  $\alpha$ .

5. A particle of mass  $m$  moves in a potential  $V(x) = \frac{1}{2}kx^2 + \frac{1}{4}\alpha x^4 + \frac{1}{6}\beta x^6$ .

Use perturbation theory to find the energy levels  $E_n$  to first order in  $\alpha$  and  $\beta$ .