

General Physics I–Honors: PHYS 101H (Fall 2023)
Quiz 3

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Instructions

In this quiz you will apply your understanding of dimensional analysis and problem solving techniques in physics. Read the following instructions carefully.

DO NOT TURN OVER THIS SHEET UNTIL INSTRUCTED.

Please write your name on the quiz.

You have ten minutes to attempt all four questions in this quiz. Two questions are open response questions and two questions are multiple choice questions. For the open response questions, write your answer, using complete sentences, in the space provided. For the multiple choice questions, indicate your answer clearly by **circling** the correct option.

You may use electronic calculators, but you will not need one.

You may **not** use:

- any formula sheets or notes;
- electronic devices, including phones, tablets and laptops (unless previously arranged);
- textbooks or other reference resources;
- course notes or slides.

You may (or may not) find the following table of Taylor series helpful:

$$\begin{aligned}\frac{1}{1+x} &= \sum_{n=0}^{\infty} x^n &&= 1 - x + x^2 - x^3 + \dots \\ \ln(1+x) &= \sum_{n=1}^{\infty} (-1)^{n-1} \frac{x^n}{n} &&= x - \frac{x^2}{2} + \frac{x^3}{3} + \dots \\ e^x &= \sum_{n=0}^{\infty} \frac{x^n}{n!} &&= 1 + x + \frac{x^2}{2} + \frac{x^3}{6} + \dots \\ \sin x &= \sum_{n=0}^{\infty} (-1)^n \frac{x^{2n+1}}{(2n+1)!} &&= x - \frac{x^3}{6} + \frac{x^5}{120} + \dots \\ \cos x &= \sum_{n=0}^{\infty} (-1)^n \frac{x^{2n}}{(2n)!} &&= 1 - \frac{x^2}{2} + \frac{x^4}{24} + \dots \\ \arctan x &= \sum_{n=0}^{\infty} (-1)^n \frac{x^{2n+1}}{2n+1} &&= x - \frac{x^3}{3} + \frac{x^5}{5} + \dots \\ (1+x)^m &= \sum_{n=0}^{\infty} \binom{m}{n} x^n &&= 1 + mx + \frac{m(m+1)}{2} x^2 + \dots\end{aligned}$$

Question 1**2pts**

Which of the following statements about a particle undergoing **uniform circular motion** is true? Circle the correct response.

- (a) The speed of the particle changes.
- (b) The velocity of the particle changes.
- (c) The magnitude of the acceleration of the particle changes.

Question 2**4pts**

Explain the difference between the **uniform** and **nonuniform circular motion**. Your answer should be expressed using complete sentences and may include equations. To receive full marks you should mention at least three correct and relevant facts, differences, and/or equations.

Question 3**2pts**

Write down the equation relating the velocities observed in two different reference frames that are moving with respect to each other at constant velocity. Be sure to define, in words, all symbols that appear in your equation!

Question 4**2pts**

Which of the following statements about Galilean transformations is true? Circle the correct response.

- (a) Galilean transformations apply to reference frames moving at very high speeds with respect to each other.
- (b) Galilean transformations apply to reference frames accelerating with respect to each other.
- (c) Galilean transformations apply to reference frames moving at constant speed with respect to each other.