

General Physics I–Honors: PHYS 101H (Fall 2023)
Quiz 4

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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 multiple-choice questions in this quiz. For each question, indicate your answer (or answers) clearly by **circling** the correct option (or options).

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 motion at constant velocity are correct? Circle the correct response.

- (a) The particle is undergoing uniform circular motion.
- (b) The particle is experiencing a net external force.
- (c) Changing the speed of the particle requires an external force acting on the particle.

Question 2**3pts**

A particle of mass 3 kg experiences an acceleration of 3 m/s^2 to the left. Forces act on the particle to the left and to the right. The force acting on the particle to the right is 2 N. What is the force acting on the particle to the left?

- (a) 10 N.
- (b) 11 N.
- (c) 12 N.

Question 3**2pts**

Which of the following statements about drawing free-body diagrams is correct? Circle the correct response.

- (a) You should include the net force, due to Newton's second law, as a separate force that causes acceleration.
- (b) You should include all forces that the body exerts.
- (c) You should include all forces that act on the body.

Question 4**3pts**

Which of the following statements about fictitious forces are correct? Circle all correct responses.

- (a) Centripetal forces are fictitious forces.
- (b) Centrifugal forces are fictitious forces.
- (c) Fictitious forces are an artefact of noninertial reference frames.
- (d) Fictitious forces are real and occur in all inertial reference frames.