

Tutorial 1: Preparation Test

PHYSICS QUESTIONS

1. An automobile manufacturer claims that their product will, starting from rest, travel 0.40 km in 9.0 s. What is the value of the acceleration required to do this?

- a. 9.9 m/s²
- b. 8.9 m/s²
- c. 6.6 m/s²
- d. 5.6 m/s²
- e. 4.6 m/s²

$$x = v_0 t + \frac{1}{2} a t^2$$

$$400 = \frac{1}{2} a 9^2 = \frac{800}{81} = 9.9$$

2. Two children start at one end of a street, the origin, run to the other end, then head back. On the way back Joan is ahead of Mike. Which statement is correct about the distances run and the displacements from the origin?

- a. Joan has run a greater distance and her displacement is greater than Mike's.
- b. Mike has run a greater distance and his displacement is greater than Joan's.
- c. Joan has run a greater distance, but her displacement is less than Mike's.
- d. Mike has run a greater distance, but his displacement is less than Joan's.
- e. Mike has run a shorter distance, and his displacement is less than Joan's.



3. The position of a particle moving along the x axis is given by $x = (21 + 22t + 6.0t^2)$ m, where t is in s. What is the velocity at $t = 3.0$ s?

- a. -28.0 m/s
- b. 40.0 m/s
- c. 58.0 m/s
- d. 76.0 m/s
- e. 141.0 m/s

$$v = 12 + 22$$

$$= 12 \times 3 + 22$$

$$= 58$$

4. A 6.0-kg object moving 5.0 m/s collides with and sticks to a 2.0-kg object moving in the opposite direction. After the collision the composite object is moving 2.0 m/s in a direction opposite to the initial direction of motion of the 6.0-kg object. Determine the speed of the 2.0-kg object before the collision.

- a. 15 m/s
- b. 7.0 m/s
- c. 8.0 m/s
- d. 23 m/s
- e. 11 m/s

$$30 + 2(-x) = 16$$

$$x = 7$$

5. You have a machine which can accelerate pucks on frictionless ice. Starting from rest, the puck travels a distance x in time t when force F is applied. If force 3F is applied, the distance the puck travels in time t is

- a. x.
- b. (3/2)x.
- c. 3x.
- d. (9/2)x.
- e. 9x.

$$F = ma$$

$$F = m \frac{d}{dt} x$$

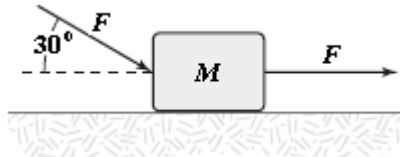
$$3F = m \frac{d}{dt} 3x$$

6. Determine the magnitude of the resulting acceleration of the block in the figure below, you may assume that the surface is frictionless. Derive values for $F = 20 \text{ N}$ and $M = 7.0 \text{ kg}$.

- a. ☒ 5.3 m/s^2
- b. 6.2 m/s^2
- c. 7.5 m/s^2
- d. 4.7 m/s^2
- e. 3.2 m/s^2

$$\frac{20 (\cos(30^\circ) \times 20) + 20}{7} = 5.3$$

$$\frac{F}{m} = a$$



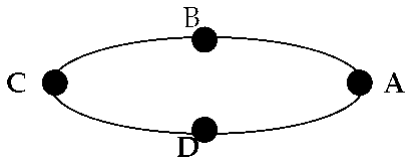
7. A 0.20-kg object attached to the end of a string swings in a vertical circle (radius = 80 cm). At the top of the circle the speed of the object is 4.5 m/s . What is the magnitude of the tension in the string at this position?

- a. 7.0 N
- b. 2.0 N
- c. ☒ 3.1 N
- d. 5.1 N
- e. 6.6 N

$$F_t = F_c - F_g$$

$$= \frac{0.2 \times 4.5^2}{0.8} - 0.2 \times 9.81 = 3.1$$

8. A car travels around an oval racetrack (see below) at constant speed. The car is accelerating

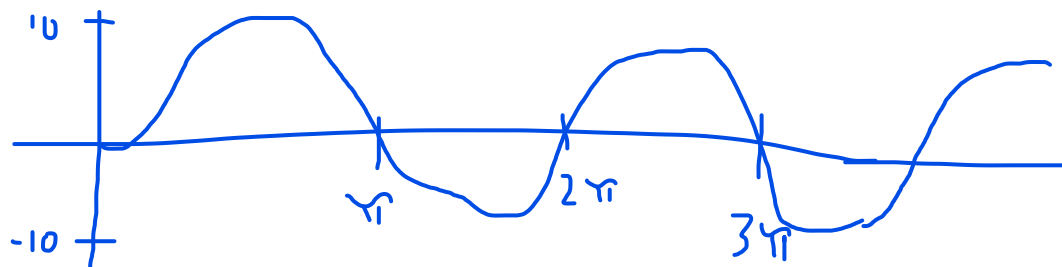


- a. at all points except B and D.
- b. at all points except A and C.
- c. at all points except A, B, C, and D.
- d. everywhere, including points A, B, C, and D.
- e. ☒ nowhere, because it is traveling at constant speed.

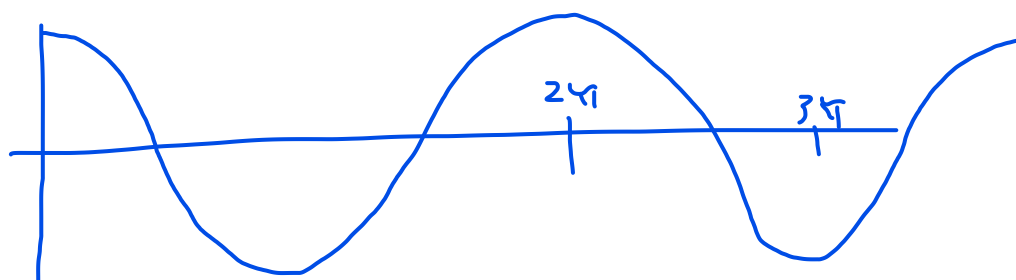
MATHS QUESTIONS

1, Sketch the following functions over the range $x=0$ to $x=10$:

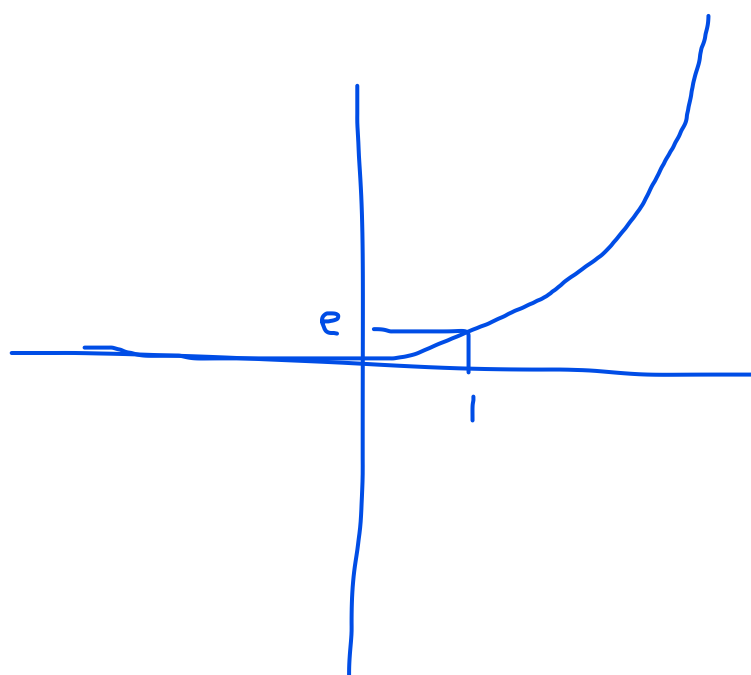
i. $10 \sin(x)$



ii. $10 \cos(x)$



(c) $\exp(x)$



2, Solve the following equations for x

(a) $3x + 4 = 2x + 6$

$$x = 10$$

(b) $x^2 - 2 = -x$

$$x^2 + x - 2 = 0$$

$$(x-1)(x+2) = 0$$

$$x = 1 \text{ or } -2$$

3, Evaluate dy/dx for each of the following:

(a) $y = x^3 + 6x^2 + 2$

$$\frac{dy}{dx} = 3x^2 + 12x$$

(b) $y = \cos(3x^2)$

$$6x \cos(3x^2)$$

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