

Quiz 2

MATH 19B - Discussion Section C
October 13, 2016

Name: _____

Directions: Showing work is only required for (3), but box in the final answer for all questions.

Formulas: Let speed, velocity, distance travelled, and displacement be represented by s , v , D , and d respectively.

$$\cos(2x) = 2\cos^2(x) - 1, \quad \sin(2x) = 2\sin(x)\cos(x), \quad s = |v|, \quad d = \int_a^b v(t) \, dt, \quad D = \int_a^b s(t) \, dt$$

(1) Determine the sign of:

$$\int_{-1001}^{1000} x^3 \sin^2(x) \, dx$$

- a) Positive
- b) Negative
- c) Neither since the integral evaluates to zero

(2) A particle modeled by the harmonic oscillator can have a velocity given by

$$v(t) = \cos(t) \frac{\text{m}}{\text{s}} \quad \forall t \in \mathbb{R}_{\geq 0}$$

Determine the displacement and distance traveled by the particle on the interval $[2\pi, 4\pi]$. Circle the displacement in the left column and the distance traveled in the right column:

- | | |
|-------------|-------------|
| a) 2π m | b) 4 m |
| c) π m | d) 0 m |
| e) 1 m | f) π m |
| g) 0 m | h) 2π m |

(3) (a) Evaluate:

$$\int_{-4\pi}^{4\pi} (\cos^2(x) + \sin^2(x)) \, dx$$

(b) You are told that the following holds true:

$$\sin(x) = \frac{e^{ix} - e^{-ix}}{2i} \quad \text{and} \quad \cos(x) = \frac{e^{ix} + e^{-ix}}{2}$$

where $i^2 = -1$. Using the above prove that sine is truly the antiderivative of cosine by evaluating:

$$\int \cos(x) \, dx = \int \frac{e^{ix} + e^{-ix}}{2} \, dx$$