Quiz 2

MATH 19B - Discussion Section B
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.

$$\cos(2x) = 2\cos^2(x) - 1, \;\; \sin(2x) = 2\sin(x)\cos(x), \;\; s = |v|, \;\; d = \int_a^b v(t)\,\mathrm{d}t, \;\; D = \int_a^b s(t)\,\mathrm{d}t$$

(1) Determine the sign of:

$$\int_{-1001}^{1000} x^3 e^{x^2}\,\mathrm{d}x$$

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

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

Determine the displacement and distance traveled by the particle on the interval $[0, 2\pi]$. 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:

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

(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:

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