Math No:

Full Name : KEY

ISTANBUL ŞEHİR UNIVERSITY

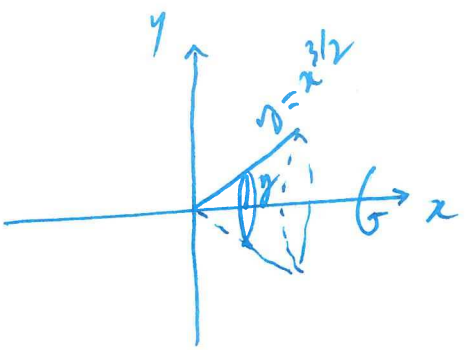
Math 104 1st Midterm Exam
(17 October 2015, Time: 11:30-12:30)

IMPORTANT

1. Write down your name and surname on top of each page. **2.** The exam consists of 4 questions, some of which may have multiple parts. **3.** Read each question carefully and put your answers neatly on the answer sheets. Simplify your answers. **4.** Show all your work. Correct answers without justification will not get credit. **5.** Unless otherwise specified, you may use any method from classwork to solve the problems. **6.** Calculators are not allowed. **7.** All cell phones and electronic devices are to be kept shut and out of sight. All cell phones are to be left on the instructor's desk prior to the exam.

Q1	Q2	Q3	Q4	TOT
5 pts	4 pts	5 pts	5 pts	19 pts

Q1. Find the volume of the solid generated by revolving the region between the x-axis and the curve $y = x^{3/2}$, $0 \le x \le 2$, about the x-axis.



$$V = \int_0^2 \pi y^2 \, dx$$

$$= \pi \int_0^2 \left(x^{3/2}\right)^2 dx = \pi \int_0^2 x^3 \, dx$$

$$= \pi \frac{x^4}{4} \Big|_0^2$$

$$= 4\pi \quad //$$

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Q2. Find the inverse function of $f(x) = \ln(1 - e^{-x})$, if it exists.

$$y = \ln(1 - e^{-x})$$

$$e^y = 1 - e^{-x}$$

$$e^{-x} = 1 - e^y$$

$$\ln e^{-x} = \ln(1 - e^y)$$

$$-x \underbrace{\ln e}_{1} = \ln(1 - e^y)$$

$$x = -\ln(1 - e^y)$$

$$f^{-1}(x) = -\ln(1 - e^x) \quad //$$

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Q3. Evaluate the following limit, if it exists.

$$\lim_{x\to 1^+} x^{1/(x-1)}$$

$$y = x^{\frac{1}{x-1}}$$

$$\ln y = \frac{1}{x-1}\ln x$$

$$\lim_{x\to 1^+} \ln y = \lim_{x\to 1^+} \frac{\ln x}{x-1}$$

$$\lim_{x\to 1^+} \ln y = \lim_{x\to 1^+} \frac{1/x}{1} \quad \text{L'Hopt.}$$

$$\lim_{x\to 1^+} \ln y = 1$$

$$\lim_{x\to 1^+} y = e^1$$

$$\lim_{x\to 1^+} x^{\frac{1}{x-1}} = e \quad //$$

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Q4. Evaluate the following limit, if it exists.

$$\lim_{x\to 0}\left(e^{-\tan x}\right)^{1/x}$$

$$y = \left(e^{-\tan x}\right)^{\frac{1}{x}}$$

$$\ln y = \frac{1}{x}\ln e^{-\tan x}$$

$$\ln y = \frac{1}{x}(-\tan x)\underbrace{\ln e}_{1}$$

$$\lim_{x\to 0}\ln y = -\lim_{x\to 0}\frac{\tan x}{x}$$

$$= -\underbrace{\lim_{x\to 0}\frac{\sin x}{x}}_{1}\cdot\underbrace{\lim_{x\to 0}\frac{1}{\cos x}}_{1}$$

$$\lim_{x\to 0}\ln y = -1$$

$$\lim_{x\to 0} y = e^{-1}$$

$$\lim_{x\to 0}\left(e^{-\tan x}\right)^{1/x} = 1/e$$