Exam 1, Mathematics 1206, Section TY11 18 copies
11:00 am–1:00 pm, September 26, 2024, 1005-IH
Instructor: Attila Máté

Follow these instructions carefully:

Work on the paper provided; do not use your own paper. *Work only on one problem on each sheet (you should not work on two different problems on the two sides of the same sheet).* On the top of each page, *print* your name (*encircle your last name*) and indicate the number of the problem you are working on by writing e.g. *"Problem #4".* Always *encircle* your final answer. If there are several parts to a problem, always indicate the part that you are answering, e.g. by writing *"Answer to Part b)"* (the number of the problem should be on the top of the page). Do not use a *red* pen or a *red* pencil. Do not write in the corner covered up by the staple (top left corner on the front side, top right corner on the back side). Each problem is worth the *same* amount of credit. **Show all your work.**

1. *a*) Find the exact value of $\operatorname{arcsec}(-2/\sqrt{3})$ (no calculator should be used for this, since a calculator can only give approximate answers).

b) Find $\cos(\arctan x)$.

c) Calculate the derivative of $x^2 \arctan x$.

2. Set up the integrals to do the following calculations. *Do not calculate any of the integrals.*

a) To find the area between the curves $y = x^2 - 3x$ and $y = 3x$.

b) To find the arc length of the curve $y = \ln x$ between the abscissas $x = 1$ and $x = 2$.

c) To find the volume obtained by rotating the region between the curves $y = \sqrt{x} - 1$, $x = 2$, $x = 5$, and $y = 0$ about the x axis by using the method of slices (also called the method of disks, washers, or cross sections).

d) To find the the volume obtained by rotating the region between the curves $y = e^{-x}$, $y = 0$, $x = 0$, and $x = 1$ about the y axis by using the method of cylindrical shells.

3. *a*) Calculate the integral

$$\int \frac{4x + 12}{x^2 + 4x + 8}\, dx.$$

b) Calculate the integral

$$\int \frac{1}{x^2\sqrt{x^2 + 1}}\, dx.$$

4. Calculate the following integrals:

a) $\displaystyle\int e^{3x} \sin x\, dx.$ *b*) $\displaystyle\int x \arctan x\, dx.$

5. Calculate the integral

$$\int \frac{2x + 1}{x^4 + x^2}\, dx.$$