Math 126
Fall 2015
Dr. Lily Yen

Test 2

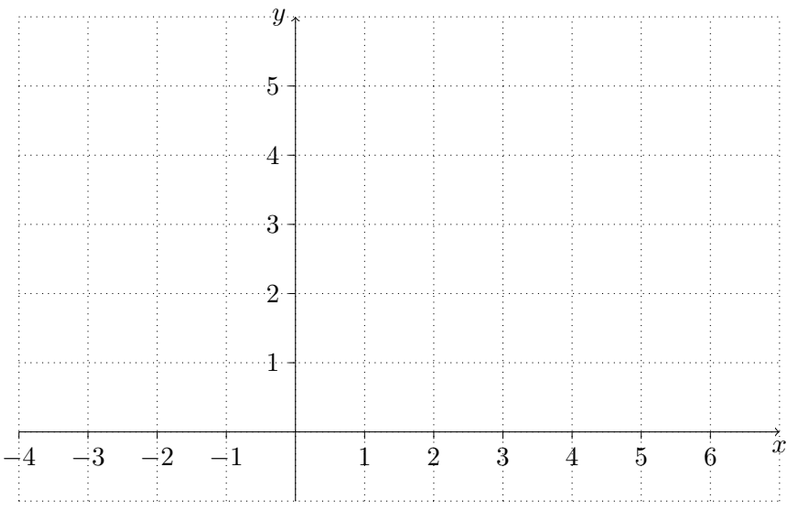
Show all your work

Name: _____

Score: ___/47

No Calculator permitted in this part. Read the questions carefully. Show all your work and clearly indicate your final answer. Use proper notation.

Problem 1: First draw $x + y^2 = 2y$ and $x + y = 0$. Shade the region enclosed by these two graphs.



Score: /2

Use integrals to express the following. Do not evaluate your integrals. Draw a cross-sectional strip for each solid of rotation.

a. The area of the shaded region.

Score: /2

b. The volume obtained if the region is rotated about $y = 5$.

Score: /2

c. The volume obtained if the region is rotated about $x = 2$.

Score: /2

d. The volume of a solid that has the shaded region as its base, and cross-sections perpendicular to the y-axis are equilateral triangles.

Score: /2

e. The volume of a solid with the shaded region as its base, and cross-sections perpendicular to the x-axis are semi-circles.

Score: /3

Problem 2: Evaluate the following integrals exactly.

a. $\int t^3 e^{t^2}\, dt$

Score: /3

b. $\int \sin(x) e^{3x}\, dx$

Score: /4

c. $\int \dfrac{x-3}{(2x-1)(x+5)}\, dx$

Score: /4

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Calculators permitted from here on.

Problem 3: Find the volume of a solid remaining after drilling a cylindrical hole of radius 3 cm out of a sphere of radius 7 cm. Give 4 decimal place accuracy.

Score: /4

Problem 4: The cardiac output of the heart is the volume of blood pumped by the heart per unit time. Cardiac output, in litres per second can be modelled over a one-second heart beat as $c(t) = \frac{3t^3}{2}\sin^2(\pi t)$. Find the average cardiac output over a one-second heart beat accurate to 4 decimal places. Draw $c(t)$ and locate specific time(s) also accurate to 4-decimal places when the average cardiac output equals to the function value.

Score: /4

Problem 5: A spring has a natural length of 0.9 m. A force of 15 N stretches the spring to a length of 1.4 m. Find the work required to stretch the spring 2 m beyond its natural length.

Score: /3

Problem 6: An inverted conical tank with height 7 m and top diameter across 10 m is filled with water with density of 1000 kg/m^3. How much work is done to pump the water out a valve 3 m above the top of the tank until the tank has a depth of 2 m?

Score: /5

Problem 7: Integrate the following exactly. $\int \cot^3(5\theta)\csc^2(5\theta)\,d\theta$

Score: /3

Problem 8: Circle improper integrals below. State a brief reason next to each item.

a. $\displaystyle\int_{2\pi}^{100\pi} x\cos(x)\,dx$

b. $\displaystyle\int_{1}^{10} \frac{dx}{x^2-x-6}$

c. $\displaystyle\int_{0}^{1} 3x\ln x\,dx$

d. $\displaystyle\int_{-50}^{50} \frac{3x}{(x^2+100)^3}\,dx$

Score: /4