Name: _____   TA's Name: _____
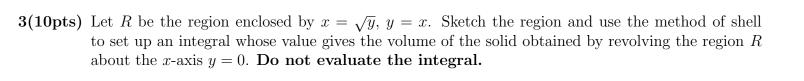
Instructions: You must show supporting work to receive full and partial credits. No text book, notes, formula sheets allowed.

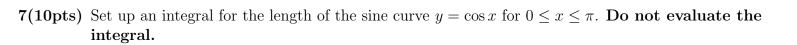**1(15pts)** Use trigonometric substitution to evaluate $\displaystyle\int \frac{4}{x^2\sqrt{x^2-4}}\,dx$.

2(10pts) Use the definition to determine if the improper integral converge: $\displaystyle\int_0^\infty xe^{-x}\,dx$. (**Show all work.**)

(Continue on Next Page ...)

3(10pts) Let R be the region enclosed by $x = \sqrt{y}$, $y = x$. Sketch the region and use the method of shell to set up an integral whose value gives the volume of the solid obtained by revolving the region R about the x-axis $y = 0$. **Do not evaluate the integral.**

4(10pts) The base of a solid is a half disk bounded by $x^2 + y^2 = 4$, $y \geq 0$. Each cross section of the solid that is perpendicular to the x-axis is a square. Set up an integral for the volume of the solid. **Do not evaluate the integral.**

5(15pts) Find the partial fraction for the rational function $\dfrac{5x^2 - x + 2}{(x-1)(2x^2+1)}$.

6(15pts) An underground cylindrical tank sitting on its side is measured 30 ft in length and 16 ft in diameter. It is full of gasoline weighing 46.189 lb per cubit foot. Set up an integral for the amount of work needed to pump the top half of the gasoline to the level that is 8 ft above the ground and the top of the tank is 4 ft below the ground. (*Hint*: Instead of the ground level measure the gasoline level against the center of the tank's circular end.) **Do not evaluate the integral.**

7(10pts) Set up an integral for the length of the sine curve $y = \cos x$ for $0 \leq x \leq \pi$. **Do not evaluate the integral.**

8(15pts) Use the Direct Comparison Test to determine whether the improper integral converge: (**Show all work.**)

$$\int_0^\pi \frac{1}{\sqrt{x} + \sin x}\, dx$$

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2 Bonus Points: The state flower of Nebraska is (a) dandeline, (b) sunflower, (c) goldenrod, (d) none of the above.   (*... The End*)