# Note ♯4 (Exam1 Review)

(1) Evaluate $\int_0^2 xe^{3x^2}\,dx$

(2) The force required to hold a spring stretched to a length of 7 $m$ is 5 $N$. Find the work required to stretch the spring from a length of 4 $m$ to 8 $m$. The natural length of the spring is 3 $m$.

(3) Find the volume of the solid $S$ whose base is bounded by the region $x^2 + y^2 = 4$, and cross-sections perpendicular to the $y$-axis are isosceles triangles with height equal to the base.

(4) Find the area bounded by $x = 3y - y^2$ and $y = -\frac{x}{2}$.

(5) Evaluate $\int \frac{\ln x}{\sqrt{x}}\, dx$.

 

(6) The region bounded by $y = \dfrac{1}{x^2}$, $x = 1$, $x = e$, and $y = 0$ is rotated around the $y$-axis. Find the volume.

(7) The region bounded by $x + y^2 = 4$ and $x - y = 2$ is rotated around the line $x = -1$. Setup an integral representing the volume of the solid.

(8) Evaluate $\displaystyle\int \frac{\cos(\ln x)}{x}\, dx$.

(9) Find the area bounded by $y = 7 - x^2$ and $y = 2x^2 - 5$.

(10) Setup an integral for the volume of the solid obtained by rotating the region bounded by $y = x^2 - x$ and $y = 2$ rotated around the line $x = 3$.

(11) Evaluate $\displaystyle\int_0^3 \frac{x^3}{\sqrt{16 + x^2}}\, dx$

(12) Find the volume of the solid obtained by rotating the region bounded by $y = \sqrt{x}$, $y = 2$, and $x = 0$ around the $y$-axis.

(13) Evaluate $\int \tan^6 x \sec^4 x \, dx$.

(14) Evaluate $\int_0^{\pi/6} \sin^2(5x)\ dx$.

(15) A bucket is used to draw water out of an 80 $ft$ well. The bucket weighs 1 $lb$ and holds 19 $lb$ of water, and the rope weighs one pound for every four feet. How much work is done?

(16) Evaluate $\int_0^{\pi/6} x\sin(2x)\,dx$.

(17) Find the area bounded by $y = x^2$, $y = x + 2$, on the interval from $x = -2$ to $x = 2$.

(18) A tank has the shape of an upside down pyramid with a square base. The tank is 10 $m$ high, 4 $m$ wide at the top, and has a spout that is 2 $m$ above the top of the tank. If the tank is filled with water 7 $m$ deep, how much work is done pumping all the water out of the spout? Use $\rho g$ for the weight density of water, and setup the integral.

(19) Evaluate $\int \cos^2 x \sin^2 x \; dx$.

(20) Evaluate $\int x^3 e^{2x} \; dx$.

(21) Evaluate $\int \sec^4 x \tan^3 x \, dx$.

(22) The region bounded by the curves $x = 1$, $y = 2$, and $y = \dfrac{8}{x}$ is rotated about the line $y = -1$.

(a) Using disk/washers set up an integral(s) that represent this volume.

(b) Using cylindrical shells set up an integral(s) that represent this volume.

(23) Set up the integral(s) that would find the volume of the solid obtained by rotating the region bounded the curves $y = 3x - x^2$ and $y = 3x - 9$.

(a) about the line $x = 5$.

(b) about the line $y = 10$.

(24) A trough is in the shape of a half cylinder (on its side). The length of the trough is 15 $ft$ and it has a radius of 7 $ft$. Assuming that the trough is filled with water to a depth of 4 $ft$. There is a spout at the top of the tank that is 2 $ft$ tall. Set up an integral that will compute the work required to pump all the water out of the spout. Be sure to indicate on the picture where you are placing the axis and the directon of the positive axis.

(25) Evaluate $\int \cos^3 x \sin^3 x \; dx$.

(26) Evaluate $\int \dfrac{x}{\sqrt{2x+1}} \; dx$.

(27) If $f$ is continuous, and $\int_0^9 f(x) \; dx = 4$, find $\int_0^3 x f(x^2) \; dx$.