Substitution Rule for Definite Integrals

Compute each of the following integrals. Clearly show the substitution used for each integral and how it was used. In other words, don't just write an answer down for any of these.

1. $\int_0^{-1} t^2\left(2-t^3\right)^6\,dt$

2. $\int_0^{\frac{\pi}{2}} \cos(x)\mathbf{e}^{1+\sin(x)}\,dx$

3. $\int_1^3 z^3+\frac{1}{4+2z}\,dz$

4. $\int_{\frac{\pi}{2}}^{\pi} \cos\left(\frac{y}{2}\right)+\sin(y)\cos(y)\,dy$

5. $\int_3^7 \frac{1}{x^2+4}-\frac{1}{3x-12}\,dx$

Area Between Curves

For problems 6 – 8 graph the enclosed region and find the area of the region. Note that you can use computational aids to do the graphs, but I do expect to see a sketch in your homework!

6. The area bounded by $y=2-\mathbf{e}^{-\frac{1}{2}x}$, $y=2+3\mathbf{e}^{-x}$, $x=-1$ and $x=2$. Note that these curves don't intersect inside this interval so you don't need to worry about that for this problem.

7. The area bounded by $y=(x-2)^2$, $y=4-x^2$, $x=-1$ and $x=4$.

8. The area bounded by $x=y^2-y-6$ and $x=4-y^2$.

Volumes – Method of Rings

For problems 9 – 11 graph the bounding region as well as an attempt at graphing the solid of revolution and a representative ring/disk. Find the volume of the solid using the method of rings/disks. Note that you can use computational aids to do the graphs, but I do expect to see them in your homework!

9. The solid obtained by rotating the region bounded by $y=(x-2)^2$ and $y=4-x^2$ about the *x*-axis.

10. The solid obtained by rotating the triangle with vertices (0, 0), (6, 0) & (6, 3) about the line $x=7$.

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11. Set up, but do not evaluate the integral that will give the volume. Use the solid obtained by rotating the region from **#6** about the line $y = -2$.

Volumes – Method of Cylinders

For problems 12 – 14 graph the bounding region as well as an attempt at graphing the solid of revolution and a representative cylinder. Find the volume of the solid using the method of cylinders. Note that you can use computational aids to do the graphs, but I do expect to see them in your homework!

12. The solid obtained by rotating the region bounded by $y = \frac{1}{2}\sqrt{x}$, $x = 4$, and the *x*-axis about the *y*-axis.

13. The solid obtained by rotating the region from **#12** about the line $y = 2$.

14. Set up, but do not evaluate the integral that will give the volume. Use the solid obtained by rotating the region from **#6** about the line $x = -3$.