

Spring 2012 Math 152

courtesy: Amy Austin
(covering sections 6.4 - 8.2)

Section 6.4

1. Find the derivative of $g(x) = \int_0^{\sin(2x)} \frac{1}{1+t^4} dt$
2. Use area to find the value of $\int_0^2 \sqrt{4-x^2} dx$
3. Use area to find the value of $\int_0^5 |x-3| dx$

Section 6.5

4. $\int_1^2 \frac{6x}{4x^2+2} dx$
5. $\int x^2 e^{1-x^3} dx$
6. $\int x \sin(x^2 - 2) dx$

Section 7.1

7. Find the area of the region bounded by the following pairs of curves.
 - a.) $y = x + 2, y = x^2$
 - b.) $x + y^2 = 2, x + y = 0$
 - c.) $y = \cos x, y = \sin x, x = 0, x = \pi$

Section 7.2 and 7.3

8. Find the volume of the solid obtained by rotating the region bounded by $y = x$ and $y = x^3$ (first quadrant only) about the x -axis.
9. Find the volume of the solid obtained by rotating the region in the first quadrant bounded by $y = x^2, y = 4,$ and $x = 0$ about the y axis.
10. Let R be the region bounded by $y = \sin x, x = 0, x = \frac{\pi}{2}$ and $y = 0$. Using the method of washers, set up the integral that gives the volume of the solid obtained by rotating R about the line $y = 1$, Do not evaluate the integral.

11. Let R be the region bounded by $y = \sin x, x = 0, x = \frac{\pi}{2}$ and $y = 0$. Using the method of cylindrical shells, set up the integral that gives the volume of the solid obtained by rotating R about the line $x = \frac{\pi}{2}$. Do not evaluate the integral.
12. Find the volume of the solid whose base is the region bounded by the line $y = 2x - 1, x = 0$ and $y = 0$. Cross sections perpendicular to the y -axis are squares.

Section 7.4

13. The force required to stretch a spring from a natural length of 1 foot to a length of 1.5 feet is 25 pounds. How much work in foot pounds is done in stretching the spring from 1.25 to 1.5 feet?
14. A tank contains water and has the shape described below. Find the work required to pump all of the water out of the tank. Assume that $\rho = 1000$ is the weight density of water (in kg/m^3) and $g = 9.8$ is the acceleration due to gravity (in m/s^2).
 - a.) The tank is a trough 8 m long. The end of the trough is a semi circle with radius 3 m, diameter at the top.
 - b.) The tank has the shape of an upright circular cone with height 5 m and radius 2m. In addition, there is a 1 meter high spout at the top of the cone from which the water exits the tank. If the tank is initially full to a water depth of 3 m, find the work required to pump all of the water out of the spout.
15. A cable that weighs 2 lb/ft is used to lift 800 lb of coal up a mineshaft 500 feet deep. Find the work done.

Section 7.5

16. Find the average value of $f(x) = x\sqrt{x+2}$ over the interval $[-1, 2]$.

Section 8.1

17. $\int x^2 \ln x dx$
18. $\int_0^1 \frac{x}{e^{3x}} dx$
19. $\int x \cos(2x) dx$

$$20. \int_0^{1/2} \arcsin x \, dx$$

$$21. \int e^{2x} \cos x \, dx$$

Section 8.2

$$22. \int \sin^2 x \cos^3 x \, dx$$

$$23. \int_0^{\pi/8} \cos^2 4x \, dx$$

$$24. \int \tan^5 x \sec^3 x \, dx$$

$$25. \int \frac{\sec^4 x}{\tan^7 x} \, dx$$

$$26. \int \frac{\sin^2(\ln x)}{x} \, dx$$