Spring 2013 Math 152

courtesy: Amy Austin
(covering sections 6.5 - 8.2)

Section 6.5

1. $\int \frac{e^{\sqrt{x}}}{\sqrt{x}}\,dx$
2. $\int x\sin\left(x^2-2\right)dx$
3. $\int_0^1 \frac{6x+1}{x^2+1}\,dx$
4. $\int \frac{x}{(x+1)^3}\,dx$

Section 7.1

5. 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

6. 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.

7. 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 by first using the method of shells, then the method of disks.

8. 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.

9. 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.

10. 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

11. 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?

12. 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 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.

13. 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

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

Section 8.1

15. $\int \sqrt{x}\ln x\,dx$
16. $\int_0^1 \frac{x}{e^{3x}}\,dx$
17. $\int x^2\cos(2x)\,dx$
18. $\int_0^{1/2} \arcsin x\,dx$
19. $\int e^{2x}\cos x\,dx$

Section 8.2

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

21. $\int \sin^3 x \cos^3 x \, dx$

22. $\int \cos^2 (4x) \sin^2 (4x) \, dx$

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

24. $\int_0^1 \sec^4 x \sqrt{\tan x} \, dx$

25. $\int \dfrac{\sin^2(\ln x)}{x} \, dx$

26. Let R be the region bounded by $y = \cos x$, $y = 0$, $x = 0$, $x = \dfrac{\pi}{4}$. Find the volume obtained by rotating the region R about the x-axis, then the y-axis.