Fall 2005 Math 152

courtesy: Amy Austin
(covering sections 6.5 - 8.4)

Section 6.5

1. $\int_1^2 \frac{6x}{4x^2+2}\,dx$
2. $\int x^3\sqrt{4x^4-9}\,dx$
3. $\int x^2 e^{1-x^3}\,dx$
4. $\int x\sin(x^2-2)\,dx$

Section 7.1

5. Find the areas of the regions bounded by the following pairs of curves.

   a.) $x+y^2=2$, $x+y=0$

   b.) $y=x+2$, $y=x^2$

   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.
8. Find the volume of the solid obtained by rotating the region bounded by $y=x^2$, and $y=2x$ about the line $x=4$. Use the method of shells.
9. Find the volume of the solid obtained by rotating the region bounded by $y=\sqrt{x}$, $x=0$, and $y=1$ about the line $y=2$.
10. Find the volume of the solid whose base is bounded by the ellipse $\frac{x^2}{4}+y^2=1$ and whose cross-sections perpendicular to the x-axis are equilateral triangles.

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 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 cylinder with height 6 m and radius 2 m. Assume the tank is full to a depth of 3 m (measuring from the bottom).

    b.) 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.

    c.) The tank has the shape of a circular cone with height 3 m and base radius 2m. In addition, there is a 1 meter high spout from which the water exits the tank. 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 $f(x)=x^2+1$ over the interval $[-1,2]$ and find the value of c that satisfies the Mean Value Theorem for integrals. Construct a rectangle whos area is equivalent to the area under the graph of $f(x)$ over the interval $[-1,2]$.

Section 8.1

15. $\int x^2\ln x\,dx$
16. $\int_0^1 \frac{x}{e^{3x}}\,dx$
17. $\int x\cos(2x)\,dx$
18. $\int \arcsin x\,dx$
19. $\int x^5 e^{x^3}\,dx$
20. $\int \cos x\ln(\sin x)\,dx$

Section 8.2

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

22. $\int_0^{\pi/4} \tan^2 x \sec^4 x \, dx$

23. $\int \sin^5 x \, dx$

24. $\int \cos^2 4x \, dx$

25. $\int \cos^2 x \tan^3 x \, dx$

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

27. $\int \dfrac{\sec^4 x}{\tan^7 x} \, dx$

28. $\int \sec^3 x \, dx$

    HINT: Write $\sec^3 x = \sec x \sec^2 x$ and use integration by parts.

Section 8.3

29. $\int \dfrac{dx}{x^2\sqrt{1-x^2}}$

30. $\int_0^3 x^3\sqrt{x^2+9} \, dx$

31. $\int \sqrt{4-9x^2} \, dx$

32. $\int \dfrac{dx}{\sqrt{x^2+4x}}$

33. $\int_0^2 \dfrac{x^2 dx}{\sqrt{x^2+4}}$

Section 8.4

34. $\int_2^3 \dfrac{dx}{(x-1)(x+2)}$

35. $\int \dfrac{x+1}{x^2-4} \, dx$

36. $\int \dfrac{2x^2-x+4}{x^3+4x} \, dx$