

MATH152, 525–530, 534–536 Spring 2013,
Sample problems for Test 1

1. Find the area of the region bounded by $y = e^x$, $y = e^{-x}$, $x = -2$, and $x = 1$.
2. Find the volume of the solid obtained by rotating the region bounded by $y = x^2 - 1$, $y = 0$, $x = 1$, $x = 2$ about the x -axis.
3. Find the volume of the solid obtained by rotating the region bounded by $y = x^2$, $y = 0$, $x = 1$, $x = 2$ about
 - (a) the y -axis
 - (b) $x = 4$
4. The base of solid S is the triangular region with vertices $(0,0)$, $(2,0)$, and $(0,1)$. Cross-sections perpendicular to the x -axis are semicircles. Find the volume of S .
5. A heavy rope, 50 ft long, weighs 0.5 lb/ft and hangs over the edge of a building 120 ft high. How much work is done in pulling the half rope to the top of the building?
6. A spring has a natural length of 20 cm. If a 25-N force is required to keep it stretched to a length of 30 cm, how much work is required to stretch it from 20 cm to 25 cm?
7. A tank in a shape of a sphere of radius 9 m is half full of water. Find the work W required to pump the water out of the spout, if the height of the spout is 3 m.
8. Find the average value of $f(x) = \sin^2 x \cos x$ on $[-\pi/2, \pi/4]$.
9. Evaluate the integral

(a) $\int t^2 \cos(1 - t^3) dt$

(b) $\int \frac{x^2}{\sqrt{1-x}} dx$

(c) $\int x^3 \sqrt{x^2 + 5} dx$

(d) $\int_0^1 x^2 e^{-x} dx$

(e) $\int \frac{\sin^3 x}{\sec^4 x} dx$

(f) $\int_0^{\pi/8} \sin^2(2x) \cos^3(2x) dx$

(g) $\int \sin^2 x \cos^4 x dx$

(h) $\int_0^{\pi/4} \tan^4 x \sec^2 x dx$

(i) $\int \tan x \sec^3 x dx$

(j) $\int \sin 3x \cos x dx$