

Calculus II
Sample Exam 2

Do all ten problems. For maximum credit, show your work and justify your answers; answers alone will seldom receive full credit. If you show your work and if your answer is wrong, you may still receive partial credit. Do not use a calculator. You need not simplify answers. Each of the ten problems is worth 10 points.

1. Find the area bounded by the curves $y = 6x - x^2$ and $y = x^2 - 2x$.
2. An object moves so that its acceleration at time t is given by $a(t) = -5$. Its initial position is $s(0) = 10$ and its initial velocity is $v(0) = 2$. Find $s(t)$ and $v(t)$.
3. Find the volume generated when the area between $y = 2x^2$ and $y = 8$ from $x = 0$ to $x = 2$ is rotated around the line $y = 10$.
4. An object moves so that its velocity is $v(t) = \sin(t)$. Find its average velocity between $t = \pi/2$ and $t = 2\pi$.
5. A rope 100 meters long is hanging straight down from the top of a building. The density of the rope is 2 kg per meter. Find the amount of work required to lift the entire rope to the top of the building. Use 9.8 for the acceleration due to gravity.
6. A spring has a natural length of $1/2$ meter. It takes a force of 5 newtons to stretch the spring to 1 meter in length. Find the amount of work required to compress the spring from its natural length to $1/4$ meter.
7. A beam 4 meters long has density $\sigma(x) = 2 + \sin(\pi x)$, where x is the distance from the left end of the beam. Find the center of mass.
8. Compute $\int_1^\infty x^{-3/2} dx$.
9. Set up an integral to compute the length of the curve given by $f(x) = \sin(x^2)$ for x in $[0, \pi]$. Do not evaluate the integral.
10. Set up an integral to compute the surface area generated when $f(x) = e^x$, for x in $[0, 2]$, is rotated around the x -axis. Do not evaluate the integral.