

Homework 10
(due Tuesday, December 2)

1. Do numbers 1-4 from section 5.4
2. Find the exact area of the region in the first quadrant bounded by $y = 3$ and $y = 3^x$
3. Find the exact area above the graph of $y = x^2$ and below the graph of $y = -3x^2 + 10$
4. Compute $\int_{-\frac{\pi}{4}}^{\frac{\pi}{4}} x^3 \cos(x^2) dx$ (Hint: This is very easy if you think about even and odd functions)
5. Do problem 34 from section 5.4
6. Air is leaking from a blimp at a rate $R(t)$, measured in m^3 per minute. Some of the values for $R(t)$ during the first 10 minutes are shown in the table below.

t	0	2	4	6	8	10
$R(t)$	-2	-3.5	-4	-3.5	-3	-2.5

- (a) Estimate $\int_0^{10} R(t) dt$ using a left-hand sum with $n = 5$. Include units in your answer.
 - (b) Give a practical interpretation of what $\int_0^{10} R(t) dt$ represents.
7. Let $k > 0$. The height (in meters) of a mass on a spring at time t (in seconds) is given by $y(t) = 3 \sin(t) + k$.
- (a) Set up the definite integral which gives the average height of the mass between $t = \frac{\pi}{2}$ and $t = \frac{\pi}{6}$ seconds.
 - (b) Evaluate the integral in part (a). Give an exact answer. Your answer will be in terms of k . Include units in your final answer.
 - (c) Suppose $\int_{-1}^1 t^2 y(t) dt = 1$. Find k . Give an exact answer.
8. Let $f(t) = (t^2 - 3t + 2)e^t$. Define the function

$$g(x) = \int_0^x f(t) dt$$

for $x \geq 0$. Find the critical points of $g(x)$.

9. Evaluate $\int \sqrt{p} \left(p + \frac{1}{\sqrt{p^3}} \right) dp$
10. Evaluate $\int (r^2 + 4)^2 dr$
11. Find y given that $\frac{dy}{dx} = 3x^2$ and $y(0) = 2$