Math 141, Fall 2000, Jeffrey Adams

Chapter 8 and 10 Review

Chapter 8

8.1: Volume of a region of cross section $A(x)$: $\int_a^b A(x)\,dx$
Volume of the solid obtained by rotation the graph of $f(x)$ around the x-axis: for the function $f(x)$: $\int_a^b \pi f(x)^2\,dx$
8.2: Length of the graph of $f(x)$: $\int_a^b \sqrt{1+(f'(x))^2}\,dx$ This can also be thought of as $\int_a^b \sqrt{dx^2+dy^2}$
8.3: Surface area of the surface obtained by rotation the graph of $f(x)$ around the x–axis: $\int_a^b 2\pi f(x)\sqrt{1+(f'(x))^2}\,dx$
8.4: Work=Force×Distance. Work done by a force $F(x)$ moving an object from a to b: $\int_a^b F(x)\,dx$.

Chapter 10

10.1: Parametrized curves: $x = x(t), y = y(t)$
10.2: Lenth of a curve paramtrized by $(f(t), g(t))$ for $a \le t \le b$: $\int_a^b \sqrt{(f'(t))^2+(g'(t))^2}\,dt$
Surface area of the surface obtained by rotating the graph of this curve about the x-axis: $\int_a^b 2\pi g(t)\sqrt{(f'(t))^2+(g'(t))^2}\,dt$
10.3: Polar Coordinates: $x = r\cos(\theta), y = r\sin(\theta)$: $r^2 = x^2+y^2, tan(\theta) = \frac{y}{x}$
The latter equations don't uniquely determine r, θ: you can replace θ by $\theta + 2\pi k$, and also change both r to $-r$ and θ to $\theta + \pi$.
10.4: Length of a curve $r = r(\theta)$ $\alpha \le \theta \le \beta$: $\int_\alpha^\beta \sqrt{r^2+(\frac{dr}{d\theta})^2}\,d\theta$
Area of the region bounded by this function: $\int_\alpha^\beta \frac{1}{2}f(\theta)^2\,d\theta$

Complex Numbers

Definition and basic properties of complex numbers ($i^2 = -1$, etc.)
Addition and multiplication of complex numbers
Absolute value and complex conjugate $\overline{x+iy} = x - iy, |z| = \sqrt{z\overline{z}} = \sqrt{x^2+y^2}$.
Complex power series
Exponential function $e^z = \sum_0^\infty \frac{z^n}{n!}$, $\cos(z), \sin(z)$
Polar decomposition $z = re^{i\theta} = r\cos(\theta) + ir\sin(\theta)$
Triginometric identities coming from $e^{i\theta+\phi} = e^{i\theta}e^{i\phi}$
Taking n^{th} roots using polar decomposition (finding solutions to $z^n = w$)