Quiz Date: September 18, 2018

Instructions: The following exercises are similar to those found in the course text book. This homework is not due for a grade, but you should know how to do all of the exedrcises and be able to show your work for each. You can expect at least one of these problems to appear on an in-class quiz on the date listed above.

6.4 - Integration with Tables and Computer Algebra Systems

1. Use the equation $\boxed{\displaystyle\int \frac{\sqrt{u^2+a^2}}{u}\,du = \sqrt{u^2+a^2} - a\ln\left|\frac{a+\sqrt{u^2+a^2}}{u}\right| + C}$ to evaluate the integral $\displaystyle\int \sqrt{e^{2m}+1}\,dm$.

2. Use the equation $\boxed{\displaystyle\int \frac{u^2}{\sqrt{a^2-u^2}}\,du = -\frac{u}{2}\sqrt{a^2-u^2} + \frac{a^2}{2}\arcsin\left(\frac{u}{a}\right) + C}$ to evaluate the integral $\displaystyle\int \arcsin(\sqrt{x})\,dx$.

6.5 - Approximate Integration

3. A table of values of a function g is given. Use the Trapezoid Rule to estimate $\int_0^{1.5} g(x)\,dx$

$\boldsymbol{x}$	0.0	0.3	0.6	0.9	1.2	1.5
$\boldsymbol{g(x)}$	8	7.7	6	6.2	5.9	4.1

4. The intensity of light with wavelength λ traveling through a diffraction grating with N slits at an angle θ is given by

$$I(\theta) = N^2\frac{\sin^2 k}{k^2}, \quad \text{where} \quad k = \frac{\pi N d\sin\theta}{\lambda}$$

and d is the distance between adjacent slits. A helium-neon laser with wavelength $\lambda = 632.8\times10^{-9}$ m is emitting a narrow band of light, given by $-10^{-6} < \theta < 10^{-6}$, through a grating with 10,000 slits spaced 10^{-4} m apart. Use the Midpoint Rule with $n = 10$ to estimate the total light intensity $\int_{-10^{-6}}^{10^{-6}} I(\theta)\,d\theta$ emerging from the grating.

5. The table below (supplied by San Diego Gas and Electric) gives the power consumption P in megawatts in San Diego County from midnight to 6:00 AM on a day in December. Use Simpson's Rule to estimate the energy (in megawatt-hours) used during that time period. Note: power is the derivative of energy.

$\boldsymbol{P}$	1814	1735	1686	1646	1637	1609	1604	1611	1621	1666	1745	1886	2052
$\boldsymbol{t}$	0:00	0:30	1:00	1:30	2:00	2:30	3:00	3:30	4:00	4:30	5:00	5:30	6:00