PRACTICE FINAL

(1) .
   (a) Express $\lim_{n\to\infty} \frac{\pi}{4n} \sum_{i=1}^{n} tan(\frac{i\pi}{4n})$ as an integral
   (b) Evaluate the integral from part (a).

(2) Find the following.
   (a) $\frac{d}{dx} \int_0^x sin(t^2)dt$
   (b) $\frac{d}{dx} \int_0^{\sqrt{x}} ln(tan(t))dt$
   (c) $\frac{d}{dx} \int_{sin(x)}^{cos(x)} e^{\sqrt{t}}dt$

(3) Find the following.
   (a) $\int e^{2sin(\theta)}cos(\theta)d\theta$
   (b) $\int \frac{2+x^2}{\sqrt{6x+x^3}}dx$
   (c) $\int_0^{\sqrt{\pi}} xcos(x^2)dx$

(4) Find the following.
   (a) $\int_{-2}^{2}(x^4+x^2+3)dx$
   (b) $\int_{-\pi}^{\pi} sin(x^5)dx$

(5) Find the following.
   (a) $\int xe^{-x}dx$
   (b) $\int arctan(1+x)dx$
   (c) $\int x^2cos(x)dx$
   (d) $\int_0^{\pi} tsin(3t)dt$

(6) Find the following.
   (a) $\int sin^2(x)dx$
   (b) $\int \frac{\sqrt{x^2-1}}{x^4}dx$
   (c) $\int_0^{\pi/4} tan^2(x)sec^4(x)dx$

(7) Find the following.
   (a) $\int \frac{x^2+2x-1}{x^3-x}dx$
   (b) $\int \frac{10}{(x-1)(x^2+9)}dx$

(8) Approximate the integral $\int_1^4 \frac{1}{x}dx$.
   (a) Use the left endpoint rule with $n = 3$ subintervals
   (b) Use the right endpoint rule with $n = 3$ subintervals
   (c) Use the midpoint rule with $n = 3$ subintervals
   (d) Use the trapezoid rule with $n = 3$ subintervals
   (e) Use Simpson's rule with $n = 6$ subintervals

(9) .
   (a) Find $\int_4^{\infty} e^{-\frac{y}{2}}dy$
   (b) Find $\int_0^3 \frac{2}{\sqrt{x}}dx$
   (c) Determine whether $\int_1^{\infty} \frac{sin^2(x)}{x^2}dx$ converges

(10) Find the area enclosed by the curves.
   (a) $y = 1+\sqrt{x}$ and $y = \frac{3+x}{3}$
   (b) $4x + y^2 = 12$ and $x = y$

(11) Find the volume of the solid obtained by rotating the region bounded by $y = \frac{1}{4}x^2$ and $y = 5 - x^2$ about the x-axis.

(12) Find the arc length of the curves
   (a) $y = \frac{x^2}{4} - \frac{ln(x)}{4}$ with $2 \leq x \leq 4$
   (b) $x = e^t + e^{-t}$, $y = 5 - 2t$ with $0 \leq t \leq 4$

(13) What is the work required to empty a conical tank with radius 1 and height 1 which is filled with a liquid with force density 1?

(14) Find the mean of the exponential distribution function $f(x) = \begin{cases} 0 & x < 0 \\ ce^{-c} & x \geq 0 \end{cases}$, where $c > 0$.