Name: **PID:** **Section:**

Quiz07-Handout Tuesday, March 24, 2015 **https://wwe.math.msu.edu/webwork2/mth_235_ss15_531xx**
Sections 001-008, 019, **xx=20,** Sections 009-016, 020, 022 **xx=40,** Section 017, **xx=60,** Section 018, **xx=80** Section 021, **xx=90**

Solve the problem(s) in this worksheet, and then put your answers into Webwork.
No calculators or any other devices allowed. If any question is not clear, please ask for clarification.
Write down all the steps needed to solve a problem; this will help you finding mistakes. Box your final answers.
When you finish the test, please turn in this worksheet to your TA.

Basic Integration Table

(1) $\int x^n\,dx = \frac{x^{n+1}}{n+1}, \quad n \neq -1; \quad \int \frac{1}{x}\,dx = \ln|x|$

(2) $\int e^{ax}\,dx = \frac{e^{ax}}{a}, \quad \int a^x\,dx = \frac{a^x}{\ln a}$

(3) $\int \ln(ax)\,dx = x\,(\ln(ax) - 1)$

(4) $\int x^n \ln(ax)\,dx = \frac{x^{(n+1)}}{(n+1)^2}\left[(n+1)\ln(ax) - 1\right]$

(5) $\int x\,e^{ax}\,dx = \frac{e^{ax}}{a^2}\,(ax-1)$

(6) $\int x^2\,e^{ax}\,dx = \frac{e^{ax}}{a^3}\,(a^2x^2 - 2ax + 2)$

(7) $\int \sin(ax)\,dx = -\frac{1}{a}\,\cos(ax)$

(8) $\int \cos(ax)\,dx = \frac{1}{a}\,\sin(ax)$

(9) $\int x\sin(ax)\,dx = -\frac{x}{a}\,\cos(ax) + \frac{1}{a^2}\,\sin(ax)$

(10) $\int x\cos(ax)\,dx = \frac{x}{a}\,\sin(ax) + \frac{1}{a^2}\,\cos(ax)$

(11) $\int e^{ax}\sin(bx)\,dx = \frac{e^{ax}}{a^2+b^2}\left[a\sin(bx) - b\cos(bx)\right]$

(12) $\int e^{ax}\cos(bx)\,dx = \frac{e^{ax}}{a^2+b^2}\left[b\sin(bx) + a\cos(bx)\right]$

(13) $\int \tan(ax)\,dx = \frac{1}{a}\,\ln|\sec(ax)|$

(14) $\int \sec^2(ax)\,dx = \frac{1}{a}\,\tan(ax)$

(15) $\int \sec(ax)\,dx = \frac{1}{a}\,\ln|\sec(ax) + \tan(ax)|$

(16) $\int \csc(ax)\,dx = -\frac{1}{a}\,\ln|\csc(ax) + \cot(ax)|$

(17) $\int \sec(ax)\tan(ax)\,dx = \frac{1}{a}\,\sec(ax)$

(18) $\int \frac{1}{a^2+x^2}\,dx = \frac{1}{a}\,\arctan\left(\frac{x}{a}\right)$

(19) $\int \frac{1}{\sqrt{a^2-x^2}}\,dx = \arcsin\left(\frac{x}{a}\right)$

(20) $\int \frac{a}{x\sqrt{x^2-a^2}}\,dx = \operatorname{arcsec}\left(\frac{x}{a}\right)$

(21) $\int \frac{1}{\sqrt{x^2-a^2}}\,dx = \cosh^{-1}\left(\frac{x}{a}\right) = \ln(x + \sqrt{x^2-a^2})$

(22) $\int \frac{1}{\sqrt{x^2+a^2}}\,dx = \sinh^{-1}\left(\frac{x}{a}\right) = \ln(x + \sqrt{x^2+a^2})$

(23) $\sinh(x) = \frac{e^x - e^{-x}}{2}, \quad \cosh(x) = \frac{e^x + e^{-x}}{2}$

Basic Laplace Transform Table

$f(t)$	$F(s) = \mathcal{L}[f(t)]$	Domain
$f(t) = 1$	$F(s) = \frac{1}{s}$	$s > 0$
$f(t) = e^{at}$	$F(s) = \frac{1}{(s-a)}$	$s > a$
$f(t) = t^n$	$F(s) = \frac{n!}{s^{(n+1)}}$	$s > 0$
$f(t) = \sin(at)$	$F(s) = \frac{a}{s^2+a^2}$	$s > 0$
$f(t) = \cos(at)$	$F(s) = \frac{s}{s^2+a^2}$	$s > 0$
$f(t) = \sinh(at)$	$F(s) = \frac{a}{s^2-a^2}$	$s > \lvert a\rvert$
$f(t) = \cosh(at)$	$F(s) = \frac{s}{s^2-a^2}$	$s > \lvert a\rvert$
$f(t) = t^n e^{at}$	$F(s) = \frac{n!}{(s-a)^{(n+1)}}$	$s > \max\{a, 0\}$
$f(t) = e^{at}\sin(bt)$	$F(s) = \frac{b}{(s-a)^2+b^2}$	$s > \max\{a, 0\}$
$f(t) = e^{at}\cos(bt)$	$F(s) = \frac{(s-a)}{(s-a)^2+b^2}$	$s > \max\{a, 0\}$
$f(t) = e^{at}\sinh(bt)$	$F(s) = \frac{b}{(s-a)^2-b^2}$	$s > \max\{a, \lvert b\rvert\}$
$f(t) = e^{at}\cosh(bt)$	$F(s) = \frac{(s-a)}{(s-a)^2-b^2}$	$s > \max\{a, \lvert b\rvert\}$
$u(t-c)$	$\frac{e^{-cs}}{s}$	$s > 0,\ c \geqslant 0$
$\delta(t-c)$	e^{-cs}	$s \in \mathbb{R},\ c \geqslant 0$
$u(t-c)\,f(t-c)$	$e^{-cs}\,F(s)$	$c \geqslant 0$
$e^{ct}\,f(t)$	$F(s-c)$	$c \in \mathbb{R}$
$f'(t)$	$s\,F(s) - f(0)$	
$f''(t)$	$s^2\,F(s) - s\,f(0) - f'(0)$	
$(-t)^n\,f(t)$	$F^{(n)}(s)$	