Prerequisite Quiz 01

Name: ______________________________

Question:	1	2	3	4	5	6	7	8	9	Total
Points:	1	1	1	1	2	4	10	5	15	40
Score:										

For multiple choice questions, circle your answer. For short answer, please be concise. Try to keep your answers in the space provided. If you run out of room for an answer, continue on the back of the page.

[1] 1. Which courses have you taken that focus on reactor statics (neutron diffusion, steady-state neutron flux)?

[1] 2. Which courses have you taken that focus on neutron transport theory?

[1] 3. Which courses have you taken that focus on obtaining analytic solutions to differential equations (ordinary or partial)?

[1] 4. Describe your experience with using numerical methods to solve differential equations.

[2] 5. Which of the following is a correct definition of the Laplace Transform? Circle the correct answer.

A. $\mathscr{L}\{f(t)\} = \int_0^\infty f(t)e^{-st}ds$

B. $\mathscr{L}\{f(t)\} = \int_0^\infty f(t)e^{st}ds$

C. $\mathscr{L}\{f(t)\} = \int_0^\infty f(t)e^{-st}dt$

D. $\mathscr{L}\{f(t)\} = \int_0^\infty f(t)e^{st}dt$

[4] 6. Use integration by parts to evaluate the following integral. Show your steps.

$$\int_0^\infty x\, e^{-b\,x}\, dx$$

[10] 7. Solve the following differential equation using the Laplace Transform. a, b, and y_0 are constants.

$$\frac{dy}{dt} = a\,y + b, \qquad y(0) = y_0$$

[5] 8. Write down a differential equation for the time-dependent, continuous-energy, neutron diffusion equation in a multiplying media, without a source term.

[15] 9. Briefly describe how the time-dependent equation from above relates to the critical reactor problem. Make sure to mention what role "k" plays in this formulation.

Laplace Transforms

Function	Transform
1	$\frac{1}{s}$
a, a is a constant	$\frac{a}{s}$
$\delta(t-\tau)$, δ is the Dirac Delta function	$e^{-\tau s}$
$H(t-\tau)$, H is the Heaviside function	$\frac{e^{-\tau s}}{s}$
$t\ H(t)$	$\frac{1}{s^2}$
e^{at}	$\frac{1}{s-a}$
$sin(at)$	$\frac{a}{s^2+a^2}$
$cos(at)$	$\frac{s}{s^2+a^2}$
$f(t)$	$\tilde{f}(s)$
$\frac{df(t)}{dt}$	$s\tilde{f}(s)-f(0)$