Instructions:
This homework is due 10 a.m. THURSDAY morning. There are no extensions. I want you
to be able to get the solutions for studying. The exam is Friday 2 - 5 p.m. This homework
is very short because I don’t want to eat into your studying time. You should be able to do
the first 3 problems right away. The last problem will require Monday’s lecture.

Starter Problem: Do this first

Starter Problem: The FB policy is very powerful when the job size distribution has
high variability and decreasing failure rate (DFR). When job sizes are Exponentially dis-
tributed, FB isn’t nearly as powerful. Your job is to evaluate the mean response time for
the M/M/1/FB queue with average arrival rate \( \lambda \) and service rate \( \mu \). Rather than trying
to do this from the M/G/1/FB formula in the book, you should instead derive this from
first principles.

[Hint: very short!] [Hint: Think Markov chain.]

Remaining Problems: 30.1, 30.5, 32.3

Problem 32.3 is not in the textbook, so I’ve stated it below:

Problem 32.3 [Preemptive-Priority Transform] Consider an M/G/1 with two priority
classes: L (low priority) and H (high priority). Low priority jobs arrive with rate \( \lambda_L \) and
have size \( S_L \). High priority jobs arrive with rate \( \lambda_H \) and have size \( S_H \). Let \( T_L \) denote the
response time of the low priority jobs. Derive \( \tilde{T}_L(s) \).

[Hint: This will be much easier if you think about the response time as composed of a
waiting time plus a residence time, then figure out each of those separately. It will help to
use the transforms that we derived in Chpt 27 and Chpt 26, but you’ll have to sometimes
make small edits to these transforms, so be careful. Your answer will involve busy periods
all over the place! Some of these will be busy periods started by certain jobs, or started by
certain work. It may be helpful to use notation like, \( B^H \), to express the duration of a busy
period made up of only high-priority jobs.]