

If it is not clear what a question is asking, request clarification from the instructor. Misreading a question is not grounds for partial credit. To receive partial credit for a calculation problem, formulas and intermediate calculations must be legibly shown. A good strategy would be to go through and answer/set up as much of each question as you can and then go back to fill in details/improve clarity.

The number preceding the question number is the point value of that particular question. Total points = 80.

(4) 1. Draw a logically consistent pair of periodic annual increment (PAI) and mean annual increment (MAI) curves on the graph below.



(5) 2. Fill in the blanks.

Age	Size	Mean Annual Increment	10 Year Periodic Annual Increment
40	—	2	3
50	—	—	—
60	130	—	—

(5) 3. Given the cumulative growth (cumulative increment) equation

$$Y = -500 + 50*A - 0.25*A^2$$

where Y is cumulative growth and A is age, analytically find (clearly showing your work) the age of maximum mean annual increment.

Equation for MAI:

Age of maximum MAI:

(3) 4. What important role does ingrowth play in the sustainable development of a managed, uneven-aged stand?

(4) 5. A permanent sample plot was measured on two occasions, time<sub>1</sub> and time<sub>2</sub>. Volume at time<sub>1</sub> was 2000 ft<sup>3</sup>/acre and volume at time<sub>2</sub> was 2800 ft<sup>3</sup>/acre. No harvesting or mortality took place on the plot between time<sub>1</sub> and time<sub>2</sub> but ingrowth over the period was determined to be 200 ft<sup>3</sup>/acre. Compute **survivor growth**.

(3) 6. What graphic (plot) is commonly used to characterize (horizontal) stand structure in forest stands?

(10) 7. Use the data below to project the stand table ten years into the future. Assume five (5) percent mortality of trees in the 8-inch DBH class and below and stand ingrowth into the 4-inch DBH class of 50 trees per acre over the ten years. Assume no cutting.

<b>DBH (inches)</b>	<b>10 Year DBH Increment (inches)</b>	<b>Current Trees per Acre</b>
4	1.2	100
6	1.6	80
8	2.2	60
10	2.1	30
12	1.8	10

(4) 8. What assumption is made regarding **future tree growth** in a stand table projection? What is (are) the weakest link(s) (component(s)) in a stand table projection?

Assumption:

Weakest link(s):

(4) 9. In applying an individual tree growth and yield model a probability of mortality = 0.10 was predicted for a tree with a current expansion factor of 80. Assume that a uniform (0,1) random number of 0.20 was generated (for purposes of stochastic simulation) for the tree. What would the new expansion factor for the tree be if treating mortality:

deterministically –

stochastically –

(5) 10. TWIGS uses the following tree and stand attributes to **predict individual tree DBH growth** for a time period. For each attribute identify what factor is being accounted for:

DBH –

Crown ratio –

Basal area of larger trees –

Site index –

(4) 11. In class we considered one means of assessing competition with a distance-dependent individual tree model (recall the diagram of tree locations with overlapping circles). Your textbook described another such “index of competition.” List the two factors that such indices take into account in evaluating competitive status of a tree.

(3) 12. Why aren't normal or empirical yield tables, early examples of whole stand growth and yield models, useful in evaluating common, alternative stand silvicultural practices?

(3) 13. What role does “elapsed time” (defined in your textbook) play in whole stand growth and yield modeling for uneven-aged stands (i.e. what does it substitute for in whole stand growth and yield models for even-aged stands)?

(3) 14. Why would the normal probability distribution function, commonly used in statistics, be a bad choice as the basis for a diameter distribution growth and yield model?

(5) 15. Once I have an estimate of the DBH distribution of a stand (e.g. a specific Weibull distribution) what steps do I take, and what other information must I have, to get **volume per acre** in the 8-inch, say, DBH class.

(3) 16. You may or may not have tried a pure thin from below (low thin) in homework question 3. Even if you did not, why would a thin from below, say removing all trees below 7-inches DBH at age 28, not likely be a favorable alternative given the quantity you were to maximize for that question?

(6) 17. Compare/contrast the growth and yield model types we discussed in class in terms of input requirements and output resolution:

Input Requirements

Output Resolution

Individual tree

Whole stand

Diameter distribution

(3) 18. What assumption, basic to ecosystem process models such as 3PG, might be of questionable validity when modeling young, pre-crown-closure, stands **OR** uneven-aged stands?

(3) 19. Canopy photosynthetic capacity (or LAI) was determined through indirect means in the applications of the 3PG model described in the assigned journal readings. What technology did that indirect measurement make use of?