HW 01: NC PROGRAMMING NAME: SOLN KEY FOR NC

The following workpiece is to have a finishing pass around its periphery (see NC Programming Notes, Figure 1).

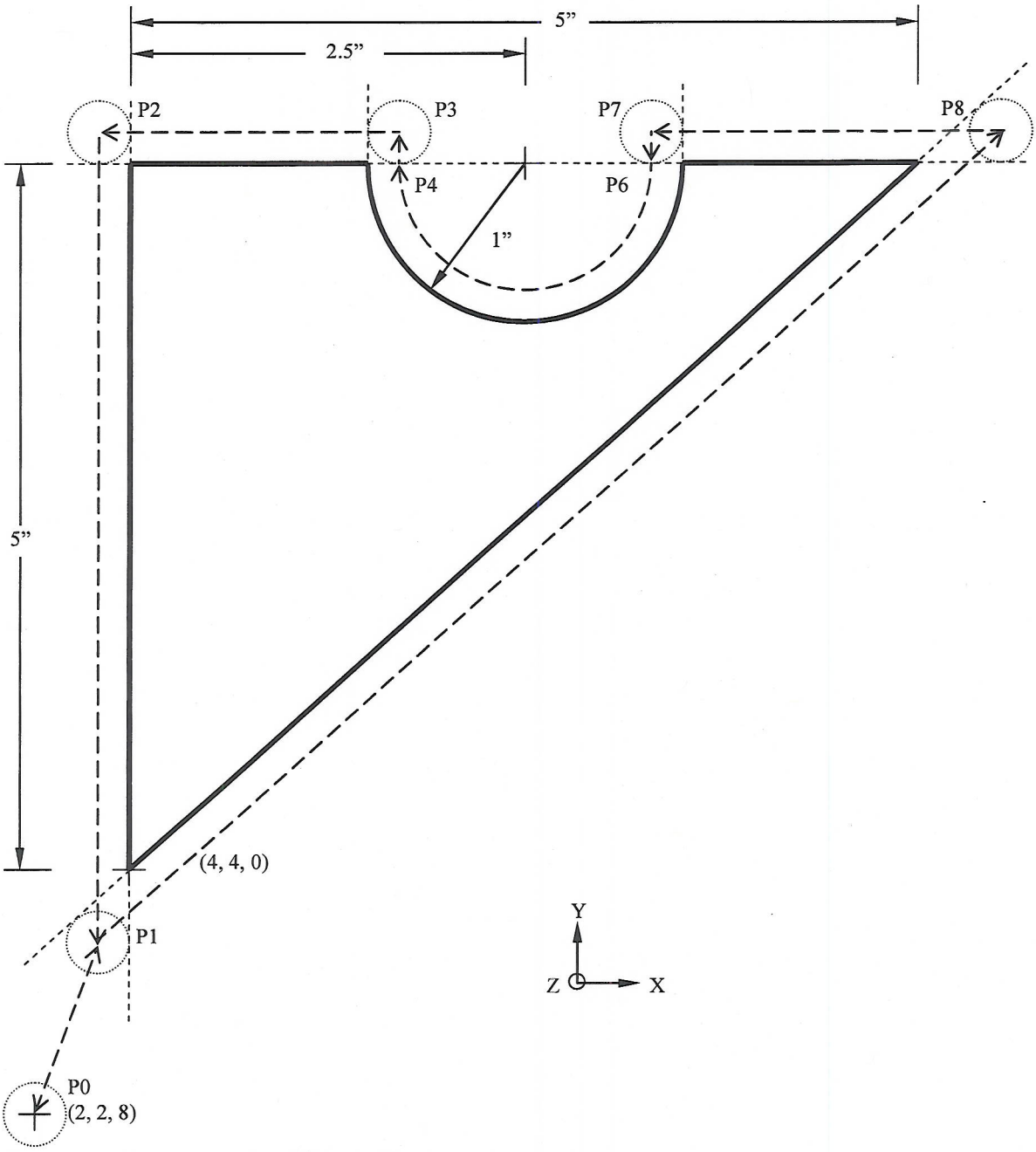

Figure 1. Workpiece for NC machining.

(HW questions are on the reverse side of this page.)

Questions:

1. Set up and create an NC program that profiles the part in Figure 1 in a counter-clockwise direction: (a) using full circle interpolation (i.e. use the points indicated, above); and (b) utilizes a coolant to flush chips from the surfaces.

   The pertinent machining data is: (a) cutter diameter is 0.25 inches; (b) feed rate is 6 inches per minute; (c) cutting speed is 300 surface feet per minute; (d) the tool home position is at (2, 2, 8); and (e) the part home position is at (4, 4, 0), referencing the lower, left corner of the top of the workpiece. (Adapted from Chang, T. C., Wysk, R. A., & Wang, H. P. (1991). *Computer-Aided Manufacturing.* Englewood Cliffs, NJ: Prentice-Hall. pp. 253-255.)

   Hint: You can save yourself a lot of geometry if you look at the calculations on the NC Programming Handout

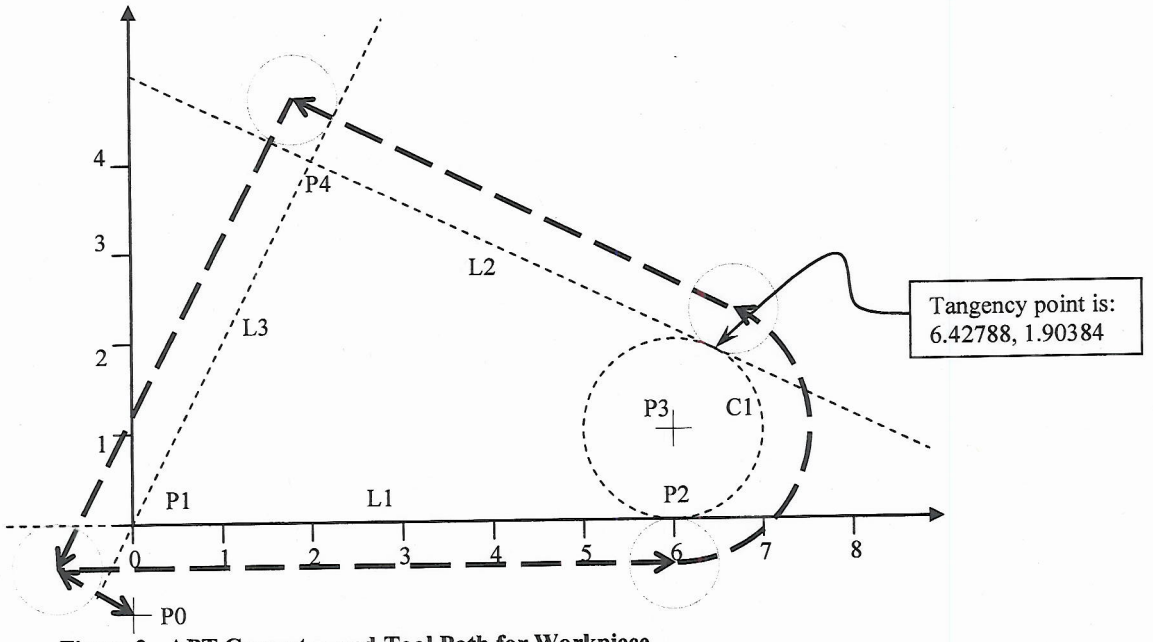

Figure 2. APT Geometry and Tool Path for Workpiece

2. An NC program for the profiling of the part in Figure 2 (see the APT Programming Notes) is to be generated. (See the APT Programming Notes) The processing parameters are: (a) feed rate is 5.39 inches per minute; (b) spindle speed is 573 revolutions per minute; (c) a coolant is to be used to flush the chips; (d) the cutter diameter is to be 0.5 inches, and (e) the tool home position is (0, -1, 0). (Adapted from Groover, M. P. (1980). *Automation, Production Systems, and Computer-Aided Manufacturing.* Englewood Cliffs, NJ: Prentice-Hall. pp. 253-255.)

   Hint: You can save yourself a lot of work if you look at the program on the APT Programming Handout and look at the NC cutter compensation codes.

You may work in pairs. Attach your work on EP Paper to this sheet and submit by the due date.

1.) $N = \frac{V}{\pi D} = \frac{(300\ FT/MIN)(12\ IN/FT)}{\pi\ (0.25\ IN)} = 4584\ RPM$

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N010 G90 F6.0 S4584 M03 M07
N020 G00 X3.875  Y3.6982 Z0.0000   (GO RAPID TO P1)
N030 G01 X9.3018 Y9.1250           (GO LINEAR TO P8)
N040 G01 X7.3750                   (GO LINEAR TO P7)
N050 G01         Y9.0000           (GO LINEAR TO P6)
N060 G02 X5.6250          I-.8750 J0.0000
                  (GO HALFWAY AROUND CIRCLE
                   TO P4, CENTER IS IN - X
                   DIRECTION FROM P6)
N070 G01         Y9.1250           (GO LINEAR TO P3)
N080 G01 X3.8750                   (GO LINEAR TO P2)
N090 G01         Y3.6982           (GO LINEAR TO P1)
N100 G00 X2.0000 Y2.0000 Z8.000    (GO RAPID TO P0)
N110 M05 M09 M30
                  (STOP SPINDLE & COOLANT,
                   BE KIND; REWIND)
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2.)

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N010 G90 F5.39 S573 D0.5 M07 M03  (START STUFF)
N020 G00 X-.2500 Y-.2500 Z-1      (START OUTSIDE PART)
N030 G42 X0.0000 Y0.0000          (CUTTER COMPENSATION RT)
                                  (WATCH MOVE TO PT 1)
N040 G01 X6.0000                  (GO LINEAR TO PT 2)
N050 G03 X6.42788 Y1.90384 I 0.0000 J 1.0000
                                  (GO CCW TO TANGENT)
N060 G01 X2.0000  Y 4.0000        (GO LINEAR TO P4)
N070 G01 X 0.0000 Y 0.0000        (GO LINEAR TO P1)
N080 G00                  Z 0.0000 (RAISE TOOL, RAPID)
N090 G00          Y-1.0000        (GO RAPID TO HOME)
N100 M05 M09 M30 G40              (TURN OFF STUFF, REWIND)
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