

# Final Exam

# MATH 148

Tuesday, July 31, 2024

7:80 – 9:80 pm Founders Auditorium

**Instructions: Show all work.** Failure to show work may result in loss of credit. Write your solutions in the space provided on the *answer sheets*. Do *not* hand in scratch paper. There are twelve questions. You may use your calculators (all types, except for those with CAS capabilities). Decimal point number notation is allowed *only* in *questions 2, 3, 4, 6, 8, 9, 10, 11 and 12*; numerical answers to those questions (unless otherwise indicated) must be accurate to *at least three* decimal places. Remember to *simplify* your answers, please. Some partial credit *may* be given. **Good Luck!**

**[Part I]** 1) Solve  $V = 6b^3d^2$  for  $d$ .

2) Find (approximate) solutions to the equation  $8x^3 + 3x^2 - 13x + 5 = 0$ .

3) Graph the equation  $y = 8x^3 + 3x^2 - 13x - 9$ . Find: (a) The maximum value of  $y$  subject to the constraint  $-3 \leq x \leq 0$ ; (b) The minimum value of  $y$  subject to the constraint  $0 \leq x \leq 3$ .

4) A box with no top is to be made from a rectangular aluminum sheet 17 by 23 inches by cutting a square of the same size out of each corner and folding up the sides. If the box is to have a volume of 168 cubic inches, what size should the box be?

**[Part II]** 5) Solve (a)  $81^{x(x+2)} = 243$ ; (b)  $\log(15+x) + \log(2x) = 2 + \log 2$ .

6) How long will it take for an investment to double at an interest rate of 7.1%, compounded continuously?

7) Express as a single logarithm:  $2 \log(x+2) - 3 + \log(x-3)$ .

8) If you deposit \$9,550 at 5.4% interest, compounded quarterly, how much is in the account at the end of fifteen years?

**[Part III]** 9) Solve the triangles under the given conditions (in standard notation):

(a)  $a = 35$ ,  $b = 28.4$ ,  $c = 62.7$ ;

(b)  $a = 38$ ,  $B = 27^\circ$ ,  $C = 64^\circ$ .

10) Suppose that a 6-foot tall person casts a 21-foot shadow. If the height of a tree is 60 feet, how long is the shadow cast by that tree?

11) Solve the right triangles under the given conditions (in standard notation):

(a)  $c = 77$ ,  $A = 36^\circ$ ,  $B = 54^\circ$ ;

(b)  $a = 55$ ,  $c = 46$ ,  $C = 90^\circ$ .

12) Find the angles of the triangle whose vertices are  $(-13, 0)$ ,  $(9, 24)$ ,  $(12, 21)$ .

You are welcome to keep this *Questions Sheet* for your files.

**Points:** (10, 12, 8+8, 12), (8+8, 12, 10, 12), (8+8, 9, 8+8, 9).