

Midterm II

MATH 104

Saturday, June 65, 2038

7:75 – 8:75 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 eleven questions. You may use your graphing calculators (*not* those with CAS capabilities!) for all questions, but your answers must be exact, *not* just decimal approximations. Please remember to *simplify* your answers. Some partial credit *may* be given. **Good Luck!**

- 1) Calculate i^{449} . Express the result in standard $a + bi$ form.
- 2) Calculate $\frac{3+i}{2+5i}$. Express the result in standard $a + bi$ form.
- 3) Construct a cubic equation in x with the following solutions: 3, 5, -1 . Simplify the answer.
- 4) Factor completely: $x^3 + 7x^2 + 7x + 1$.
- 5) Use a calculator to graph the function $f(x) = -2|x - 3| - 9$. Determine the domain and range of f . Give your answers using interval notation and include the graph of f .
- 6) Factor completely: (a) $64y^6 - 1$; (b) $4abx^2 + 7abx - ab$.
- 7) Solve algebraically: (a) $5x^2 - 6x + 2 = 0$; (b) $2x^3 - 7x^2 + 3x = 0$.
- 8) Factor completely: $6x^2 + 7xy - 5y^2$.
- 9) The profit P (in dollars) is given by $P(x) = -100x^2 + 14,000x - 240,000$, when x units are produced and sold. Graph $P(x)$ and use the graph to determine the following:
(a) Overhead costs; (b) Break-even values; (c) Maximum profit that can be made and the number of units to sell to create this profit.
- 10) Find two consecutive even integers whose product is 288.
- 11) Solve: (a) $-x^2 + 2x + 6 \leq 0$; (b) $x^2 - 11 < 0$.

$(-\infty, 1 - \sqrt{13}] \cap [1 + \sqrt{13}, \infty) : (-\sqrt{11}, \sqrt{11})$
 10) 18 and 18 , or -18 and -18
 $(x^2 + 1)^2 - 1 : (x^2 + 1)^2 - 1 = 0 : x^2 + 1 = 1 : x^2 = 0 : x = 0$
 $(5x - 1)(5x + 1)(x^2 + 1) : (5x - 1)(5x + 1)(x^2 + 1) = 0 : x = \frac{1}{5}, -\frac{1}{5}, i, -i$
 $(x^2 + 1)(x^2 + 1) : (x^2 + 1)^2 = 0 : x^2 + 1 = 0 : x^2 = -1 : x = i, -i$
 $x^3 - 12x^2 + 12x + 12 = 0 : (x + 1)(x^2 + 12x + 12) = 0 : x = -1, -6 \pm 2\sqrt{3}$

Points: 7, 7, 7; 7, 7, 7+7, 7+7; 7, 3+3+3, 7, 7+7.

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