MATH 120: Midterm 2

Last name:_____

First name:_____

March 15

V number:_____

Lecturer: Jephian Lin
[A01 - CRN 21993]

Contents: cover page,
5 pages of questions

Duration: **50 minutes**

Page	Points	Score
1	7	
2	6	
3	5	
4	4	
5	6	
Total	28	

Do not open this packet until instructed to do so.

Instructions:

- Enter your Name and V number before you start.

- The only calculator permitted is the Sharp EL-510R, EL-510RN or EL-510RNB. No other electronic devices are permitted.

- Any work necessary to arrive at an answer must be shown on the examination paper. Marks will not be given for final answers that are not supported by appropriate work.

- Clearly indicate your final answer to each question either by **underlining it or circling it**. If multiple answers are shown then no marks will be awarded.

1. Let $f(x) = x^2 + 6x + 5$.

   (a) [2pt] Find p and q such that $f(x) = (x + p)^2 + q$.

   (b) [2pt] Find a and b such that $f(x) = (x + a)(x + b)$.

   (c) [1pt] The graph of $f(x)$ is a parabola. Does this parabola open upward or open downward?

   (d) [1pt] Solve the inequality $f(x) < 0$.

2. [1pt] Let $f(x) = x^3 - 2x^2 + 5x$. Given that $1 + 2i$ is one of the roots of $f(x)$. Find all the other (real and imaginary) roots of $f(x)$.

3. Let $f(x) = 2x^3 - 4x^2 - 6x + 20$.

(a) [2pt] Find the quotient and the remainder of $f(x) \div (x + 2)$. That is, find a polynomial $q(x)$ and a number r such that

$$f(x) = (x + 2) \cdot q(x) + r.$$

(b) [1.5pt] Find all the (real and imaginary) roots of $f(x)$.

4. Let $f(x) = x^3 - 2x^2 - 5x + 6$.

(a) [2pt] According to the rational root theorem, write down all possible candidates for the rational roots of $f(x)$.

(b) [1.5pt] Find all the (real and imaginary) roots of $f(x)$. [In fact, all the roots of $f(x)$ are real and rational.]
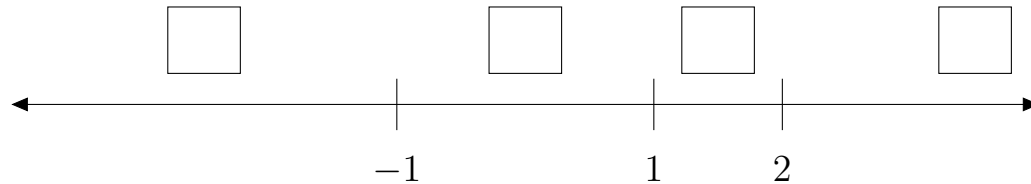
5. Let
$$f(x) = \frac{2(x-1)(x-2)}{3(x+1)(x-2)} = \frac{2x^2 - 6x + 4}{3x^2 - 3x - 6}.$$

(a) [1pt] Find the y-intercept.

(b) [1pt] Find the x-intercept(s).

(c) [1pt] Find all values of x where $f(x)$ is not defined.

(d) [2pt] Use the one point test to complete the sign chart below. That is, for each of the four boxes below, write either $+$ or $-$ to indicate the sign of $f(x)$ on that interval.

[Question 5 continued]

(e) [0.5pt] When x is a very large number (close to ∞), the value of $f(x)$ will

be very close to the number _____. [You may try by your calculator.]

(f) [0.5pt] When x is a very small number (close to $-\infty$), the value of

$f(x)$ will be very close to the number _____. [You may try by your
calculator.]

(g) [3pt] Sketch the graph of $f(x)$ that illustrates all the features you answered in Question 5, including the labels of each intercept. [Two points have been plotted for you.]
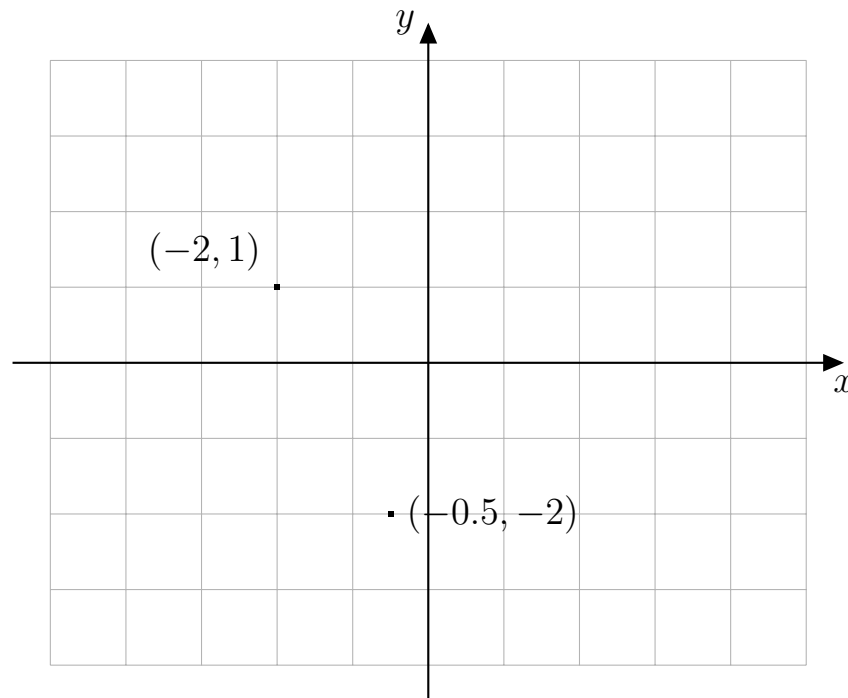
6. [4pt] The graph below is a unit circle (a circle with radius 1) and the number on each line is the angle in radian. Write down the coordinates of each of the 4 points on the unit circle. [If your answer is numerical, round your answer to the nearest hundredth.]
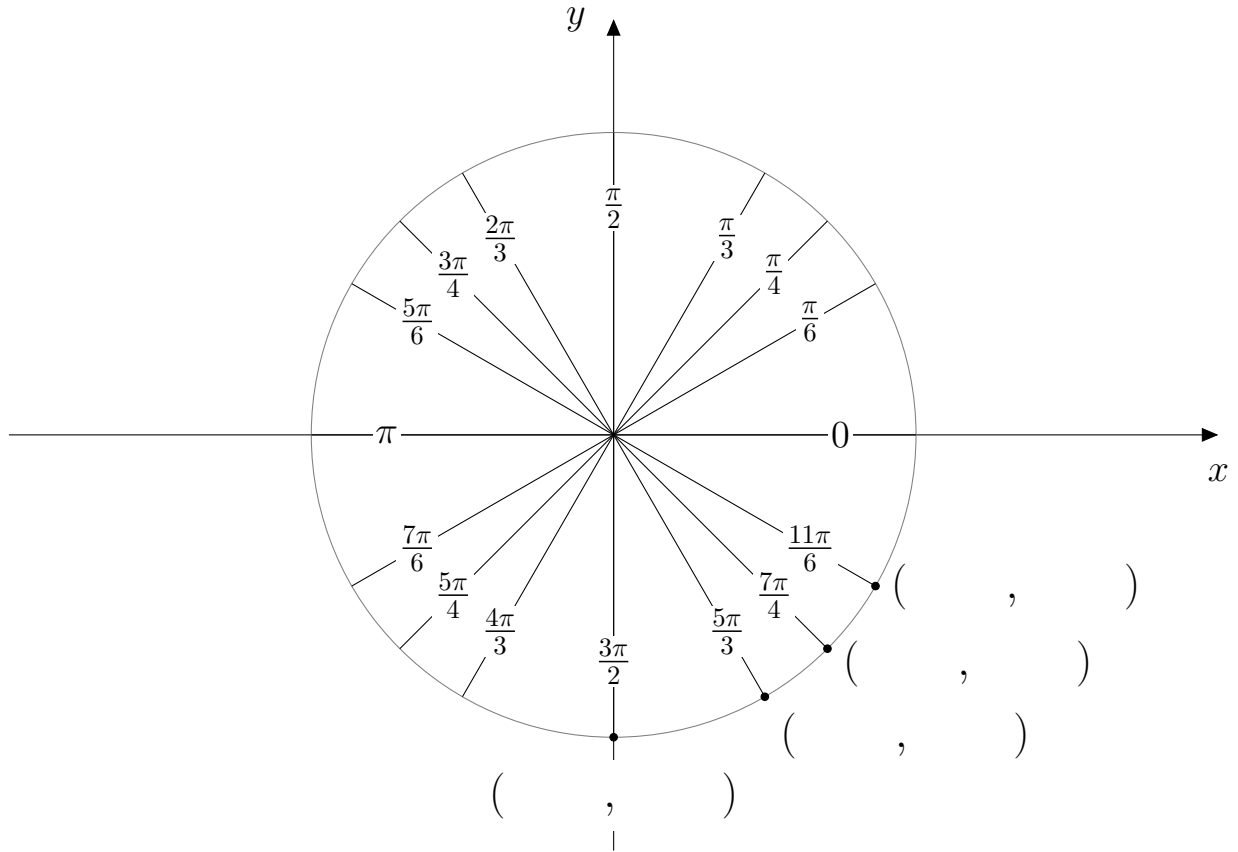
7. [2pt] Find the length of the arc with radius 10 and angle $135°$. [If your answer is numerical, round your answer to the nearest hundredth.]