MATH 115: EXAM 03

BLAKE FARMAN
UNIVERSITY OF SOUTH CAROLINA

Answer the questions in the spaces provided on the question sheets and turn them in at the end of the class period. Unless otherwise stated, all supporting work is required. You may **not** use any calculators.

Name: Answer Key

Problem	Points Earned	Points Possible
1		20
2		20
3		20
4		20
5		20
Total		100

Date: November 5, 2014.

1. Problems

1. *What are the possible zeroes of the polynomial function*

$$f(x) = x^3 - 8x^2 + 5x + 14?$$

$\pm 1, \pm 2, \pm 7, \pm 14$

2. *Decide whether the binomial $x+1$ is a factor of the polynomial $x^6 - x^5 + 3x^3 - 2x^2 + 3$. Carefully* **justify** *your answer.*

$x+1$ is a factor of $p(x) = x^6 - x^5 + 3x^3 - 2x^2 + 3$

if and only if

$$p(-1) = 0$$

by the factor theorem ~~So~~ we see

$$p(-1) = (-1)^6 - (-1)^5 + 3(-1)^3 - 2(-1)^2 + 3$$
$$= 1 - (-1) + 3(-1) - 2 + 3$$
$$= 1 + 1 - 3 - 2 + 3$$
$$= 2 - 2 + 3 - 3$$
$$= 0,$$

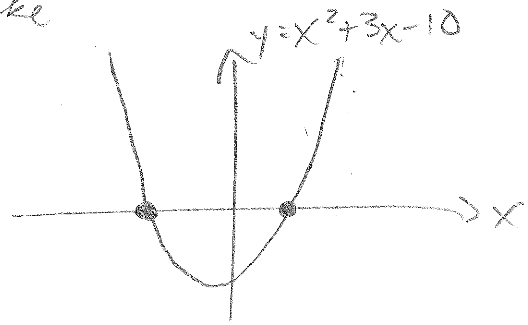
and thus $x+1$ is a factor of $p(x)$.

3. *Solve the inequality*

$$x^2 + 3x - 10 > 0$$

and give your answer in interval notation.

Factor $x^2+3x-10 = (x+5)(x-2)$ to see that the zeroes are $x=2, x=-5$. Since this is an upward facing parabola, we see it looks roughly like



Therefore the x-values for which $x^2+3x-10>0$ are

$$(-\infty,-5) \cup (2,\infty).$$

4. *Solve the equation*

$$\log_2(x+3) + \log_2(x-3) = 4$$

for x.

$$4 = \log_2(x+3) + \log(x-3)$$
$$= \log_2((x+3)(x-3))$$
$$= \log_2(x^2-9)$$
$$\Rightarrow 2^4 = 2^{\log_2(x^2-9)}$$
$$\Rightarrow 16 = x^2-9$$
$$\Rightarrow x^2 = 25$$
$$\Rightarrow x = \pm 5.$$

Since $-5+3<0$ and $-5-3<0$, -5 is not in the domain of $\log_2(x+3)+\log_2(x-3)$. Therefore the only solution is $x=5$.

Check: $\log_2(5+3)+\log_2(5-3) = \log_2(8)+\log_2(2)$
$= 3+1$
$= 4.$ ✓

5. *Solve the equation*

$$\ln(x) + \ln(x-2) = \ln(3)$$

for x.

$$\ln(3) = \ln(x) + \ln(x-2)$$
$$= \ln(x(x-2))$$
$$= \ln(x^2 - 2x)$$
$$\Rightarrow e^{\ln(3)} = e^{\ln(x^2-2x)}$$
$$\Rightarrow 3 = x^2 - 2x$$
$$\Rightarrow 0 = x^2 - 2x - 3$$
$$= (x-3)(x+1)$$

So the possible solutions are $x=3$ and $x=-1$. However, $\ln(-1)$ is undefined, so the only solution is $x=3$.

<u>Check</u>: $\ln(3) + \ln(3-2) = \ln(3) + \ln(1)$
$$= \ln(3) + 0$$
$$= \ln(3). \checkmark$$