平成23年度　入学者選抜学力試験（前期）

数　　　学

注 意 事 項

1. 試験開始の合図があるまで，この問題冊子と解答冊子を開かないでください．

2. 問題は必須問題と選択問題に分かれています．ページ番号のついていない紙は下書き用紙です．

3. 必須問題は3問あります（1ページ）．選択問題は問題範囲ごとにそれぞれ2問ずつあります．数学II・数学Bの問題は2ページに，数学III・数学Cの問題は3ページにあります．

4. 解答冊子は，必須問題用と選択問題用の2冊に分かれています．それぞれの解答冊子の表紙の所定欄に氏名と受験番号をはっきりと記入してください．

5. 選択問題は解答する問題範囲を選び，選択問題用解答冊子の表紙の解答問題欄の選択欄に○印を記入してください．○印を記入していない場合，または複数の問題範囲に○印を記入した場合は，0点となります．

6. 下書き用の計算用紙は解答冊子の中に綴じてあります．

7. 試験中に問題冊子の印刷不明瞭，ページの落丁・乱丁および解答用紙の汚れ等に気がついた場合は，静かに手を上げて監督員に知らせてください．

8. 試験終了後，問題冊子は持ち帰ってください．

9. 解答時間は120分です．

10. 問題ごとに配点が記されています．

必須問題

I x, y は実数とする．命題「$3x^2 + y^2 + 4xy \neq 0$ ならば $x + y \neq 0$ である」について，以下の問いに答えよ．（配点 60 点）

   問1 命題の逆，裏，対偶をそれぞれ述べよ．

   問2 命題を証明せよ．

   問3 命題の裏の反例を 1 つあげよ．

II 以下の問いに答えよ．（配点 60 点）

   問1 3 次方程式 $4x^3 - 3x + 1 = 0$ を解け．

   問2 $\log_2 \cos\theta + \log_2 \left(\sin^2\theta - \dfrac{1}{4} \right) + 2 = 0$ を満たす θ で，$0 \leqq \theta \leqq \pi$ の範囲にあるものを求めよ．

III 関数 $f(x) = x^2 - 2|2x - 1| + 2$ について，以下の問いに答えよ．（配点 60 点）

   問1 $y = f(x)$ のグラフを描け．

   問2 $y = f(x)$ のグラフと x 軸で囲まれた 2 つの部分の面積の和を求めよ．

   問3 $y = f(x)$ のグラフに，異なる 2 点で接する直線を求めよ．

必須問題は，このページで終りである．

選択問題 (数学 II・数学 B)

I 座標平面において，原点を通り傾きが $\tan 2\theta$ の直線を ℓ で表す．ただし，θ は $0 < \theta < \dfrac{\pi}{4}$ を満たすとする．中心が第 1 象限に属し，直線 ℓ と x 軸に接する半径 1 の円 C を考える．さらに，円 C と 直線 ℓ および x 軸に接し，中心が第 1 象限に属する 2 つの円のうち，面積が大きいものを C' で表す．以下の問いに答えよ．（配点 60 点）

問1 円 C の方程式を求めよ．

問2 円 C' の半径を，θ の関数として表せ．

問3 円 C' の円周の長さが，円 C の円周の長さの 3 倍になるように θ の値を定めよ．

II 2 次関数 $f(x) = x^2 - 2x + 2$ について，以下の問いに答えよ．（配点 60 点）

問1 t を実数とする．$t - 1 \leqq x \leqq t$ の範囲において，$f(x)$ の最大値を t の関数の形で求めよ．

問2 問 1 で求めた t の関数を $p(t)$ とおく．t がすべての実数値をとって変化するとき，座標平面上の点 $(t, p(t))$ の軌跡を描け．

問3 t を実数とする．$t - 1 \leqq x \leqq t$ の範囲において，$f(x)$ の最小値を t の関数の形で求めよ．

問4 問 3 で求めた t の関数を $q(t)$ とおく．t がすべての実数値をとって変化するとき，座標平面上の点 $(t, q(t))$ の軌跡を描け．

数学 II・数学 B の問題は，このページで終りである．

選択問題 (数学 III・数学 C)

I 座標平面上の 2 点 A $(-2,0)$, B $(2,0)$ を端点とする線分 AB と楕円の上半分 $x^2 + 4y^2 = 4$, $y \geqq 0$ に 4 つの頂点がある台形 ABCD について，以下の問いに答えよ．ただし，点 C は第 1 象限，点 D は第 2 象限に属しているとする．（配点 60 点）

 問 1 点 C の x 座標を $2\cos\theta$ $\left(0 < \theta < \dfrac{\pi}{2}\right)$ とするとき，台形 ABCD の面積を θ を用いて表せ．

 問 2 台形 ABCD の面積の最大値を求めよ．また，そのときの点 C の x 座標を求めよ．

II 数列 $\{a_n\}$ の一般項を

$$a_n = \int_0^{n\pi} e^{-x} \sin x \, dx \quad (n = 1, 2, 3, \cdots)$$

で定めるとき，以下の問いに答えよ．（配点 60 点）

 問 1 $\sin x = (-\cos x)'$ を用いた部分積分法により，

$$a_n = A_n - \int_0^{n\pi} e^{-x} \cos x \, dx \quad (n = 1, 2, 3, \cdots)$$

となるときの A_n を求めよ．

 問 2 問 1 で求めた A_n について，$a_n = \dfrac{A_n}{2}$ が成り立つことを示せ．

 問 3 $\displaystyle\lim_{n\to\infty} a_n$ を求めよ．

数学 III・数学 C の問題は，このページで終りである．

2011 Entrance Exam

23

English

1.
2.　　　　1　9

3.
4.

5.
6.　　　　　　90
7.
8.
9.　Part 1　　　　　　　　　　　　60
10.　Part 2　　Part 5　　　　　　　　　　　　140

Part 1 Reading Comprehension

Read the following article and answer the questions (1)–(6). (60   )

After World War II, many Japanese united under a common goal: rebuild Japan into an economically powerful nation. That goal was accomplished. Between the late 1950s and the 1980s, Japan's economy grew at an astonishing rate of around ten percent annually[1]. Today's younger generation should take great pride in the efforts of their parents and grandparents, as they would not have many of the modern luxuries that are often taken for granted. If this economic growth had not occurred, it is possible that Japan would be an extremely different country.

Unfortunately, Japan's economy peaked when the bubble economy collapsed in 1991. The world has since changed dramatically in the almost two decades that have passed. Communication technologies, driven by the strong acceptance and absorption of the Internet in the daily lives of people throughout the industrialized world, have improved so rapidly that it is impossible, or at least foolish, for companies to continue using business models that are decades old. To survive, or better yet thrive, in today's global economic climate, drastic changes are needed.

In July of 2010, one Japanese company announced a major change. To become a global player in the Internet shopping market, Rakuten announced that all employees must speak English by 2012. ①When the new policy takes effect in 2012, all internal meetings will take place in English regardless of whether native speakers are present or not. Rakuten's president, Hiroshi Mikitani, has stated that all current employees who cannot speak English by 2012 will lose their jobs[2].

Why such drastic measures? While Rakuten is currently the largest Internet shopping site in Japan, President Mikitani has his eyes on much bigger goals. According to Japan Today, he expects that overseas business will account for 70% of the total number of sales in the near future[3]. He also expects to establish Internet sales in 27 countries and regions. Obviously, he believes that if the majority of his 6,000 employees cannot speak English, these goals are impossible.

Of course, there are critics to Mikitani's plans to make English the official language of a Japanese company. Is it realistic to expect employees to learn the English language in just two years? Can effective communication take place using a second language? Many people will be watching to see if this experiment will lead to profitable results.

According to the Japan Times, Rakuten is not the only company trying to create a stronger English environment in the workplace. Fast Retailing Co., which owns the clothing store Uniqlo, also plans to make English its official language from March 2012. Many other Japanese companies, such as Nissan and Nomura Holdings, have such a large global reach that English is needed for many of their employees.

English is only one of many skills that can help Japanese companies prosper globally. Japan is a country with great potential but unless the young generation takes some initiative, Japan will lose the competitive edge it once had over other Asian countries with growing economies such as China and South Korea. As their grandparents once did, it is hoped that young people will think strongly about the future of Japan and take the time to increase their skills so they can contribute to making their vision a reality.

References:

[1] Japan Culture Profile. "Post-war economic recovery." Accessed Aug 15, 2010 at http://www.culturalprofiles.net/japan/Directories/ Japan_Cultural_Profile/-13226.html

[2] Matsunatani, M. "Rakuten's all-English edict a bold move, but risky too." Japan Times, July 16, 2010. Accessed Aug 15, 2010 at http://search.japantimes.co.jp/cgi-bin/nn20100716f1.html

[3] "Rakuten to make English official in-house language by end of 2012," Japan Today, July 1, 2010. Accessed Aug 15, 2010 at http://www.japantoday.com/category/technology/view/rakuten-to-make-english-official-in-house-language-by-end-of-2012

(1)

a. Hiroshi Mikitani's Vision of Japan

b. English as Japan's National Language

c. Adapting for Globalization

d. Rakuten's Plan for English Doomed for Failure

(2)

20

a. The way people around the world communicate has changed.

b. English has become the dominant language in business.

c. Countries need to depend on domestic sales.

d. All people have Internet access in their homes.

(3)

a. He thinks the majority of his employees will be unable to communicate in English by 2012.

b. He believes that if Rakuten doesn't adapt to globalization, the company's future profits will be limited.

c. He believes that Rakuten will be less dependent on the Internet once employees can communicate in English.

d. He is upset that other companies are creating English policies as well.

(4)

　　a. Japan had about four decades of double-digit economic growth in the 20th century.

　　b. One factor that led to Japan's post-war success was the hard work of its citizens.

　　c. Other countries are rivaling Japan for the role of Asia's economic leader.

　　d. Japan must look to increasing global profits due to its decreasing population.

(5)　　　①

(6)

　　a. Japan's younger generation is ready and enthusiastic about adapting to globalization.

　　b. Japan's youth can build a strong nation if they take responsibility for their future.

　　c. The future success of Japan is independent of the attitude of the younger generation.

　　d. People will only adapt to globalization if forced to do so by companies.

Part 2   Questions about a Japanese text

Read the following article and answer the questions (1) – (3) **in English**.
(30   )

40

ON LINE   2010   9   6

http://business.nikkeibp.co.jp/article/money/20100902/216076/

(1) According to the article, what is the biggest problem the global society has faced? Write your answer in one paragraph (about 20 to 30 words).

(2) According to the article, what are the characteristics of a smart city? Write your answer in one paragraph (about 20 to 30 words).

(3) According to the article, what is needed in Japan to create a smart city? Write your answer in one paragraph (about 20 to 30 words).

Part 3 Opinions

The article in Part 1 gave the example of how Rakuten is going to have an English policy from 2012. Do you think this policy will help the company be successful? Write your opinion in one or two paragraphs (about 125 to 150 words). **(Write in English)** (40)

Part 4　Explanatory Skills

Write one or two paragraphs (about 125 to 150 words) explaining how you plan to contribute to Japan's future. **(Write in English)** (　　40　　)

Part 5   Personal Response

The last paragraph of the article in Part 1 states: "English is only one of many skills that can help Japanese companies prosper globally." What are two other skills that could help strengthen Japan on a global scale? Explain your answer. (about 100 to 125 words) **(Write in English)** (30   )