

MATHEMATICS B
M\$6 Homework 36
Spring Recess Assignment
Due Monday, April 24, 2006

ANSWER SHEET

Student:

Period:

**This examination has four parts, with a total of 34 questions.
Your answers to Part I should be recorded on this answer sheet.**

Part I

Answer all 20 questions in this part.

- | | | | |
|---------|----------|----------|----------|
| 1 | 6 | 11 | 16 |
| 2 | 7 | 12 | 17 |
| 3 | 8 | 13 | 18 |
| 4 | 9 | 14 | 19 |
| 5 | 10 | 15 | 20 |

Your answers for Parts II, III, and IV should be written in the test booklet or, if necessary, on separate sheets of paper attached to this booklet.

You must show all work necessary for all parts, including Part I (multiple choice).

Part I

Answer all questions in this part. Each correct answer will receive 2 credits. No partial credit will be allowed. For each question, write on the separate answer sheet the numeral preceding the word or expression that best completes the statement or answers the question. [40]

1 Which of the following transformations is a direct isometry?

- (1) $r_{y=x} \circ r_{x\text{-axis}}$ (3) $T_{-4,2} \circ r_{x=3}$
(2) $R_{90^\circ} \circ r_{y\text{-axis}}$ (4) $r_{y=-x} \circ D_{\frac{1}{2}}$

Use this space for
computations.

2 If one root of a function is $\frac{1}{2} - 2i$, what is the equation of this function?

- (1) $4x^2 - 17x + 4 = 0$ (3) $x^2 - x + 17 = 0$
(2) $4x^2 - 4x + 17 = 0$ (4) $4x^2 + 4x + 17 = 0$

3 If $\cos \theta < 0$ and $\tan \theta < 0$, in what quadrant does θ terminate?

- (1) I (3) III
(2) II (4) IV

4 Which point on the graph of $y = \cos x$ corresponds to the point

$\left(-\frac{1}{2}, \frac{\sqrt{3}}{2}\right)$ on the unit circle?

- (1) $\left(\frac{5\pi}{6}, \frac{\sqrt{3}}{2}\right)$ (3) $\left(\frac{2\pi}{3}, \frac{\sqrt{3}}{2}\right)$
(2) $\left(\frac{5\pi}{6}, -\frac{1}{2}\right)$ (4) $\left(\frac{2\pi}{3}, -\frac{1}{2}\right)$

5 Solve $-2 \cos x = \sqrt{3}$ for all values of x in the interval $0 \leq x \leq 2\pi$.

- (1) $\frac{\pi}{6}, \frac{5\pi}{6}$ (3) $\frac{5\pi}{6}, \frac{7\pi}{6}$
(2) $\frac{\pi}{3}, \frac{2\pi}{3}$ (4) $\frac{4\pi}{3}, \frac{5\pi}{3}$

6 A guy wire stretches from the top of an antenna tower to a point on level ground 20 feet from the base of the tower. The angle between the wire and the ground is 65° . What is the approximate height of the tower?

- (1) 49 feet (3) 35 feet
(2) 43 feet (4) 18 feet

Use this space for computations.

7 Express $1 + i^2 + \frac{3 + 3i}{3 + i}$ in simplest $a + bi$ form.

- (1) $\frac{12+6i}{10}$ (3) $1 + 3i$
(2) $\frac{4}{5} + 0i$ (4) $\frac{6}{5} + \frac{3}{5}i$

8 Suppose $\frac{\pi}{2} < x < \pi$ and $\frac{3\pi}{2} < y < 2\pi$. If $\tan x = -\frac{4}{3}$ and $\tan y = -\frac{5}{12}$, what is the value of $\sin(x + y)$?

- (1) $-\frac{56}{65}$ (3) $\frac{33}{65}$
(2) $-\frac{16}{65}$ (4) $\frac{63}{65}$

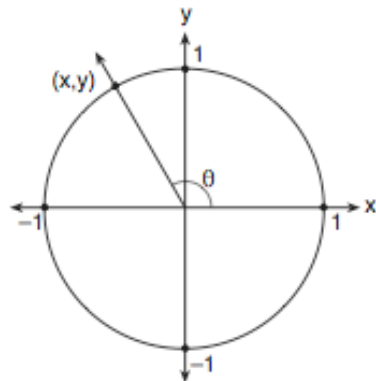
9 The inverse of a function is a logarithmic function in the form $y = \log_b x$. Which equation represents the original function?

- (1) $y = b^x$ (3) $x = b^y$
(2) $y = bx$ (4) $by = x$

10 Kimberly has a flower garden that resembles the coordinate plane. She had planted a flower at point $F(5, -6)$ and would like to plant another flower at point F' , the image of point F after a translation defined by $T_{1,11}$. Which other transformation on F would produce F' ?

- (1) $r_{y=-x}$ (3) R_{90°
(2) $r_{y\text{-axis}}$ (4) R_{-90°

11 In the accompanying diagram of a unit circle, the ordered pair (x, y) represents the point where the terminal side of θ intersects the unit circle.



If $x = -\frac{1}{2}$, what is one possible value for θ ?

- (1) 60° (3) 145°
(2) 120° (4) 150°

Use this space for computations.

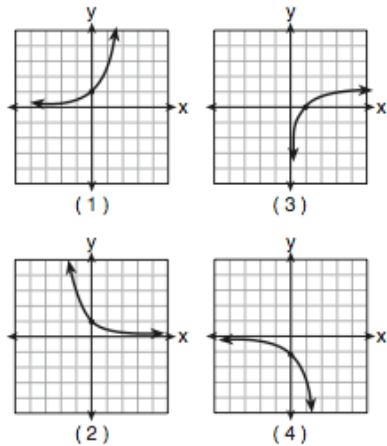
12 If $0^\circ < \theta < 360^\circ$, the solutions of the equation $9^{\sin \theta} = 3$ are 30° and

- (1) 150° (3) 320°
(2) 210° (4) 330°

13 If $\log x = \log a - 3 \log b$, x is equal to

- (1) $a - 3b$ (3) $\frac{a}{3b}$
(2) $a - b^3$ (4) $\frac{a}{b^3}$

14 Which graph represents the inverse of the equation $y = 3^x$?



15 The graph of the equation $x^2 + 2y^2 = 5$ is

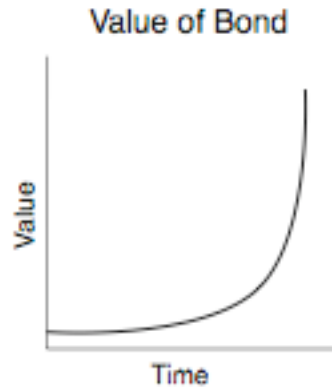
- (1) a circle (3) a parabola
(2) an ellipse (4) a hyperbola

16 If θ is an obtuse angle and $\sin \theta = b$, then it can be concluded that

- (1) $\tan \theta > b$ (3) $\cos 2\theta > b$
(2) $\cos \theta > b$ (4) $\sin 2\theta < b$

17 The accompanying graph represents the value of a bond over time.

Use this space for computations.



Which type of function does this graph best model?

- (1) trigonometric (3) quadratic
(2) logarithmic (4) exponential

18 The multiplicative inverse of $4 + i$ is

- (1) $\frac{4-i}{17}$ (3) $\frac{4-i}{15}$
(2) $\frac{4+i}{17}$ (4) $\frac{4+i}{14}$

19 The expression $N = \frac{\sqrt[4]{x^2y}}{z}$ is equivalent to

- (1) $\log N = \frac{1}{4}(2 \log x + \log y - \log z)$
(2) $\log N = \frac{1}{4}(2 \log x + \log y) - \log z$
(3) $\log N = \frac{1}{4} \log 2x + \frac{1}{4} \log y - \log z$
(4) $\log N = \frac{2}{4} \log x + \frac{1}{4} \log(y - z)$

20 If $x = 4$, the value of $4x^{\frac{1}{2}} + (x^0 + 3)^{-1}$ is

- (1) $\frac{11}{28}$ (3) $8\frac{1}{7}$
(2) $4\frac{1}{3}$ (4) $8\frac{1}{4}$
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Part II

Answer all questions in this part. Each correct answer will receive 2 credits. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. For all questions in this part, a correct numerical answer with no work shown will receive only 1 credit. [12]

21 Solve for all values of x that satisfy the equation $\sqrt{x^2 + 7} = x + 1$.

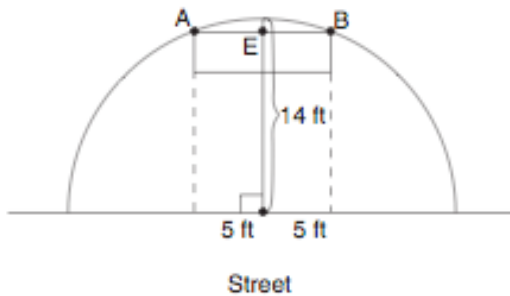
22 Show that the product of $a + bi$ and its conjugate is a real number.

23 If $\cos x = -\frac{4}{5}$ when $90^\circ < x < 180^\circ$, find the value of $\sin 2x$.

24 Find the solution set of the equation $5 \csc \theta - 2 = 1$ in the interval $0^\circ \leq x < 360^\circ$.

25 A wheel of a mountain bike has a radius of 1 foot. Find the distance the bike travels when the wheel rotates through angles of 40° and 750° .

26 The accompanying diagram shows a semicircular arch over a street that has a radius of 14 feet. A banner is attached to the arch at points A and B , such that $AE = EB = 5$ feet. How many feet above the ground are these points of attachment for the banner?



Part III

Answer all questions in this part. Each correct answer will receive 4 credits. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. For all questions in this part, a correct numerical answer with no work shown will receive only 1 credit. [24]

27 Depreciation (the decline in cash value) on a car can be determined by the formula $V = C(1 - r)^t$, where V is the value of the car after t years, C is the original cost, and r is the rate of depreciation. If a car's cost, when new, is \$25,000, the rate of depreciation is 35%, and the value of the car now is \$10,000, how old is the car to the *nearest tenth of a year*?

28 Solve for x in simplest $a + bi$ form: $4x - 4 = -\frac{17}{x}$.

29 The growth in the number of people who own a new computer can be modeled by the function $y = 6(3.45^x)$, where y is the number of people *in millions* with a new computer and x represents the number of years since 2000. How many years, *to the nearest thousandth of a year*, would it be until the number of people who own a new computer reaches 700 million?

30 Let $f(x) = 4x^2 - 1$ and $g(x) = \frac{x+2}{3}$.

- a Find the value of $(f \circ g)(7)$.
- b Express $(g \circ f)(x)$ in simplest form.
- c Find the value of $(g \circ g^{-1})(3)$.

31 Find, to the nearest tenth of a degree, all values of θ in the interval $0^\circ \leq \theta \leq 360^\circ$ that satisfy the equation $\cos 2\theta - \sin^2 \theta + \sin \theta + 1 = 0$.

32 The period, T , in seconds, of an angular pendulum with a 1 meter arm is given by the formula

$$T = 2\pi \sqrt{\frac{\cos \theta}{9.8}}$$

If you want to build a pendulum with a period of 1.8 seconds, at what angle, to the *nearest degree*, should you hold the arm?

Part IV

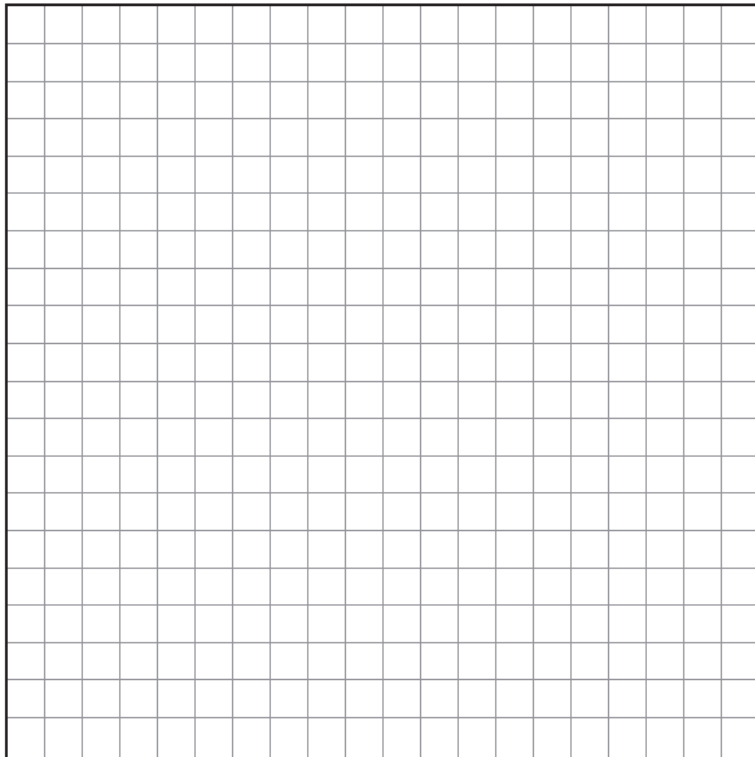
Answer all questions in this part. Each correct answer will receive 6 credits. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. For all questions in this part, a correct numerical answer with no work shown will receive only 1 credit. [12]

33 Stephanie has observed that the number of squirrels she sees varies sinusoidally over the course of a year.

She found that the equation $S(t) = -30 \cos\left(\frac{\pi}{6}t\right) + 50$ provided a good model for the average number of

squirrels, $S(t)$, Stephanie sees per month where t represents the number of months since December 1.

Sketch the graph of $S(t)$ in the interval $0 \leq t \leq 12$. Determine when Stephanie saw the most squirrels and state the number of squirrels that she saw at that time. During what months did she see an average of less than 1 squirrel per day?



34 Show that $\frac{\cos 2\theta}{\cos^2 \theta} = 2 - \sec^2 \theta$