King Fahd University of Petroleum and Minerals
College of Sciences, Prep-Year Math Program

Code 004

Math 002, Exam I
Term (002)
Saturday, March 17, 2001
6:30 - 8:10 p.m.

Code 004

STUDENT's NAME:_____

ID #:_____ SECTION #:_____

This Exam consists of 2 parts

Part I: **Multiple Choice Questions:** *Encircle the Correct Answer Only*

Part II: **Written Part:** *You must show all necessary work for every Question*

Calculators are not allowed in the Exams

Question	Points	Student's Score
Part I (i - v)	3x5= 15	
1	6	
2	9	
3	7	
4	7	
5	8	
6	10	
7	11	
8	7	
9	8	
10	12	
Total	100	

• **Part I (Circle the correct answer)** (3 points each)

1. A central angle in a circle of diameter 10 cm has a measure of 1 radian if it intercepts an arc with length equal to

   (a) 10 cm

   (b) $\frac{5}{2}$ cm

   (c) 20 cm

   (d) 5 cm

2. To apply the Rational Zeros Theorem on a polynomial $p(x)$, all coefficients of $p(x)$ should be

   (a) Real numbers

   (b) Nonreal numbers

   (c) Real or nonreal numbers

   (d) Integers

3. If $f(x) = \frac{p(x)}{q(x)}$ is a rational function and a is a real number, then $x = a$ is a vertical asymptote of the graph of $f(x)$ if

   (a) $p(a) = 0$ and $q(a) \neq 0$

   (b) $p(a) = 0$ and $q(a) = 0$

   (c) $p(a) \neq 0$ and $q(a) = 0$

   (d) $p(a) \neq 0$ and $q(a) \neq 0$

4. Let $p(x)$ be a polynomial with real coefficients. If U is an upper bound for all real zeros of $p(x)$, L is a lower bound for all real zeros of $p(x)$, and C is a real zero of $p(x)$ such that $U \neq L \neq C$, then

(a) $L < C < U$

(b) $U < C < L$

(c) $L < U < C$

(d) $U < L < C$

5. For $a > 0$, $a \neq 1$ and $x > 1$, the expression $y = \log_a(x - 1)$ is equivalent to

(a) $y = a^{x-1}$

(b) $x = a^y + 1$

(c) $x = a^{y-1}$

(d) $y = (x - 1)^a$

• **Part II: Answer the following problems and show your work.**

1. (a) Find the angle θ such that the angle θ and the angle $150°\ 50'\ 23''$ are supplementary (3 points)

(b) Convert the angle $\frac{\pi}{18}$ radian to revolutions. (3 points)

2. (a) Find the value of (4 points)

(i) $\ln\left(\frac{1}{e^3}\right) + e^{\ln 7}$

(ii) $2\log_3\sqrt{18} - \log_3 2$

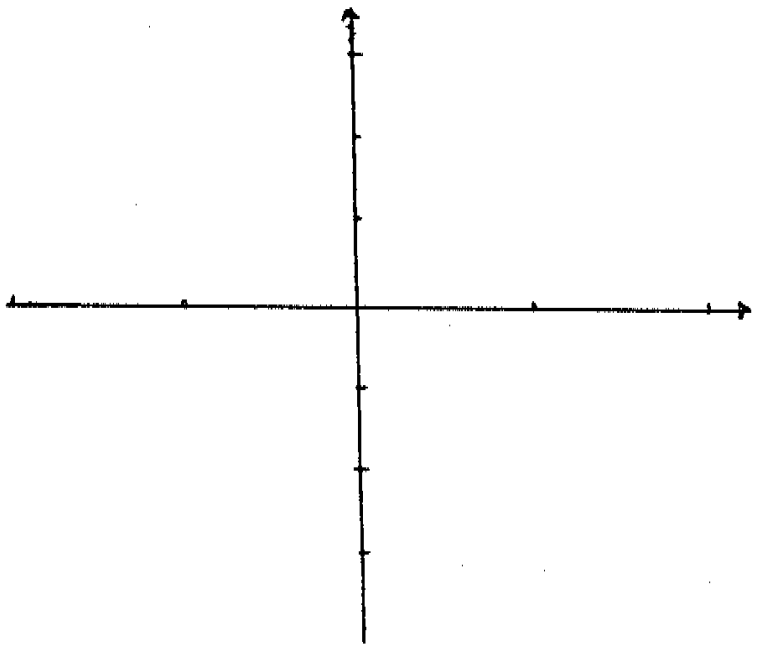
(b) Let x and y be positive real numbers. Write down the following as a single logarithm: (5 points)

$$1 + \log_2(x^2y^3) - \frac{1}{2}\log_2(x^6y^4).$$

3. Find the solution set of the equation (7 points)

$$x^4 + x^3 - 2x^2 - 6x - 4 = 0.$$

4. Graph the polynomial function $p(x) = x^2(4x^2 - 1)$ (showing all intercepts). (7 points)



5. If $2 + i$ is a zero of $p(x) = x^4 - 4x^3 + 6x^2 - 4x + 5$, find the other zeros. (8 points)

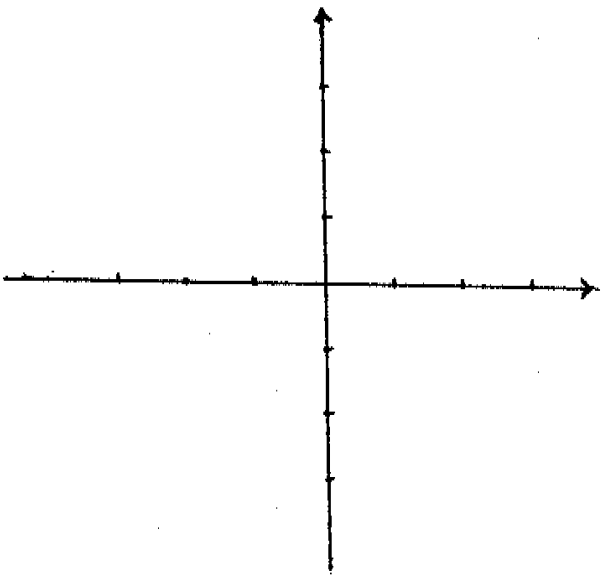
6. Solve the following equations: (10 points)

(a) $\log(x - 2) + \log(x + 1) = 1$.

(b) $4^x - 7 \cdot 2^x + 12 = 0$. (Hint: simplify, then factor)

7. (a) Let $f(x)$ be a logarithmic function such that $f(2) = 3$. Find the value of $f(4)$. (4 points)

(b) Sketch the graph of $g(x) = -\left(\frac{1}{3}\right)^x + 3$. Write down the range of g and all asymptotes (if any). (7 points)



8. A wheel on a truck has a diameter of $\frac{12}{\pi}$ feet. How far does the truck move as the wheel turns through an angle $105°$? (7 points)

9. Use Descartes' rule of signs to discuss the nature of zeros of the polynomial $p(x) = 2x^5 - 5x^4 - 12x^3 + 3x^2 - 14x + 8$. Summarize all possibilities of all zeros of $p(x)$ in a table. (8 points)

10. Given the rational function $f(x) = \dfrac{x^3 - 2x^2 - 3x}{x^3 - x}$.

(a) Find all asymptotes and missing points. (6 points)

(b) Graph $f(x)$. (6 points)