

MATH 150  
Fall 2007  
Aurisp  
Exam 2 - Form A

PRINTED Name: \_\_\_\_\_ Section Number: \_\_\_\_\_

Please read and sign below:

**On my honor, as an Aggie, I have neither given nor received unauthorized aid on this academic work.**

Signature: \_\_\_\_\_

Instructions:

- Part I is Multiple Choice and True/False. Clearly circle the letter of your answer.
- Part II is Work Out. Show ALL your work. Partial credit is possible. A correct answer without any work will NOT receive full credit. Please write clearly and legibly, and write your final answer in the blanks provided.
- Calculators are not allowed for this exam.
- There are problems on both the front and back of the pages. So make sure you answer them all.
- **Academic Dishonesty Will NOT Be Tolerated.**

GOOD LUCK. DO YOUR BEST.

**Part I: Multiple Choice.** Each problem is worth 5 points. Clearly indicate your answers.

- For the polynomial  $P(x) = x^4 - 3x^3 - 2x^2 + 5x - 1$ , how many positive or negative real zeros are possible?
  - 3 or 1 positive real zeros, 1 negative real zero
  - 2 or 0 positive real zeros, 2 or 0 negative real zeros
  - 2 or 0 positive real zeros, 1 negative real zero
  - 3 or 1 positive real zeros, 2 or 0 negative real zeros
  - None of the above
  
- Find the terminal point on the unit circle determined by  $t = -\frac{17\pi}{6}$ .
  - $(-\frac{1}{2}, \frac{\sqrt{3}}{2})$
  - $(-\frac{\sqrt{3}}{2}, \frac{1}{2})$
  - $(-\frac{1}{2}, -\frac{\sqrt{3}}{2})$
  - $(-\frac{\sqrt{3}}{2}, -\frac{1}{2})$
  - None of the above
  
- What is the end behavior for the graph of the polynomial  $P(x) = -4x^9 + 5x^7 - 6x + 2$ ?
  - As  $x \rightarrow -\infty$ ,  $y \rightarrow \infty$ ; As  $x \rightarrow \infty$ ,  $y \rightarrow \infty$
  - As  $x \rightarrow -\infty$ ,  $y \rightarrow \infty$ ; As  $x \rightarrow \infty$ ,  $y \rightarrow -\infty$
  - As  $x \rightarrow -\infty$ ,  $y \rightarrow -\infty$ ; As  $x \rightarrow \infty$ ,  $y \rightarrow \infty$
  - As  $x \rightarrow -\infty$ ,  $y \rightarrow -\infty$ ; As  $x \rightarrow \infty$ ,  $y \rightarrow -\infty$
  - Not enough information given
  
- What is the domain of the function  $f(x) = \log_7(x^2 - 2x - 15)$ ?
  - $(-3, 5)$
  - $(-3, \infty)$
  - $(5, \infty)$
  - $(-\infty, -3) \cup (5, \infty)$
  - $(0, \infty)$
  - None of the above

5. If  $\csc t > 0$  and  $\tan t < 0$ , what Quadrant is the terminal point of  $t$  in?

- (a) Quadrant I
- (b) Quadrant II
- (c) Quadrant III
- (d) Quadrant IV
- (e) Not enough information

6. Simplify the expression  $\frac{1-i}{2-3i}$  and write in standard form as  $a+bi$ .

- (a)  $\frac{1}{5} - \frac{1}{5}i$
- (b)  $-1 - \frac{1}{5}i$
- (c)  $-\frac{1}{13} + \frac{1}{13}i$
- (d)  $\frac{5}{13} + \frac{1}{13}i$
- (e) None of the above

7. Combine the following expression into one single logarithm.  $\frac{\log_5(x+y) + 3\log_5 x}{\log_5 100 - \log_5 4}$

- (a)  $\log_5\left(\frac{x^4y}{25}\right)$
- (b)  $\log_5\left(\frac{x^3+x+y}{25}\right)$
- (c)  $\log_5(x^2\sqrt{y})$
- (d)  $\log_5\left(\frac{x^3(x+y)}{25}\right)$
- (e)  $\log_5\sqrt{x^3(x+y)}$
- (f)  $\log_5\left(\frac{x^3(x+y)}{2}\right)$

8. True/False (2 points each) Circle True or False for each of the following statements about the graphs of functions.

- (a) TRUE FALSE The graph of the function  $r(x) = \frac{x^3 + x^2 + 2x + 7}{x - 4}$  has a slant asymptote.
- (b) TRUE FALSE If  $0 < a < 1$ , then the graph of  $f(x) = a^x$  is an increasing function.
- (c) TRUE FALSE The graph of  $f(x) = e^x - 4$  has horizontal asymptote  $y = -4$ .
- (d) TRUE FALSE The graph of  $f(x) = \csc x$  has a vertical asymptote at  $x = \frac{\pi}{2}$ .
- (e) TRUE FALSE The period of  $f(x) = \tan(3x)$  is  $\frac{\pi}{3}$ .

**Part II: Work Out Problems.**

9. (12 points) Consider the rational function  $r(x) = \frac{5(x+4)(x-3)}{(x-2)^2(x+5)}$

(a) Determine the  $x$ -intercept(s).

(b) Determine the  $y$ -intercept(s).

(c) Find any vertical asymptotes, if they exist.

(d) Find any horizontal asymptotes, if they exist.

(e) On what interval(s) would the graph of  $r(x)$  be negative (below the  $x$ -axis)? Express your answer in interval notation.

Answer: \_\_\_\_\_

10. (6 points) Find the amplitude, period, and phase shift for the graph of  $f(x) = -7 \cos(4x - \frac{\pi}{8})$ .

Amplitude: \_\_\_\_\_, Period: \_\_\_\_\_, Phase Shift: \_\_\_\_\_

11. (12 points) Consider the polynomial  $P(x) = 2x^3 - x^2 + 3$ .

(a) List all possible rational zeros of this polynomial.

(b) Find ALL zeros (real or nonreal) for this polynomial. (Hint: One of them is a negative rational number.)

Zeros: \_\_\_\_\_

(c) Factor the polynomial completely.

Factorization:  $P(x) =$  \_\_\_\_\_

12. (8 points) Solve the equation:

$$\log_6(x - 4) + \log_6(x + 1) = 1$$

Answer: \_\_\_\_\_

13. (10 points) Given that  $\cos t = \frac{\sqrt{5}}{3}$  and that the terminal point of  $t$  is in Quadrant IV, find all other trig values for  $t$ . Rationalize any denominators.

$\sin t =$  \_\_\_\_\_,  $\tan t =$  \_\_\_\_\_,  $\csc t =$  \_\_\_\_\_,  $\sec t =$  \_\_\_\_\_,  $\cot t =$  \_\_\_\_\_

14. (7 points) Suppose there are currently 100 bees in a hive. The population of this hive is growing exponentially with a relative growth rate of 9% per year.

(a) Find a function  $n(t)$  which models the size of the population at a given time  $t$ , where  $t$  is in hours.

(b) After how many years will the population have tripled?