

Mat 194 Final Exam  
Fall 2004

Name: \_\_\_\_\_

Thursday, December 16, 2004  
5:00 – 7:00 pm

SUID: \_\_\_\_\_

(1) [15 pts] Let  $f(x)$  be a line with slope 3 and containing the point  $(1,5)$ .

(a) [5 pts] What is the slope-intercept form of the equation for  $f(x)$ ?

(b) [5 pts] If  $g(x)$  is a line perpendicular to  $f(x)$ , and  $g(x)$  has an  $x$ -intercept of 6, what is the equation for  $g(x)$  in slope-intercept form?

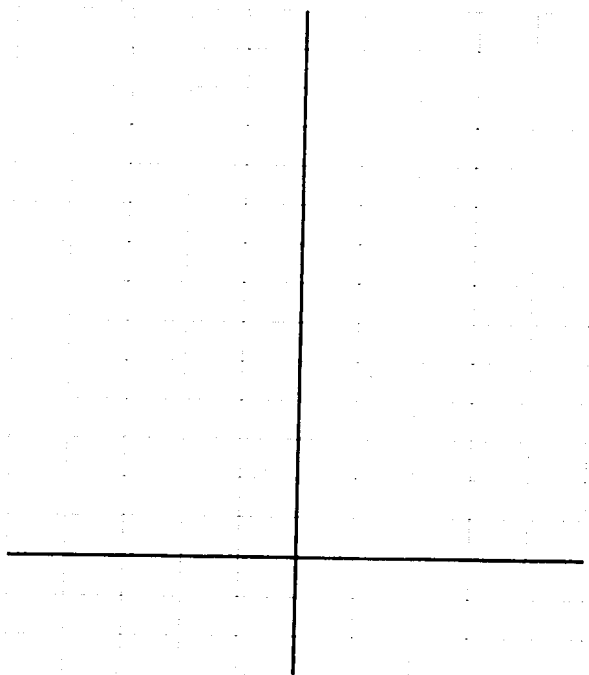
(c) [5 pts] Where do  $f(x)$  and  $g(x)$  intersect?

(2) [31 pts] Let  $f(x) = \begin{cases} -\frac{1}{2}x + 7 & x \leq -4 \\ (x+1)^2 & -4 < x \leq 0 \\ -x + 1 & x > 0 \end{cases}$ .

(a) [5 pts] Complete the following table:

|        |    |    |    |    |   |   |   |   |   |
|--------|----|----|----|----|---|---|---|---|---|
| $x$    | -4 | -3 | -2 | -1 | 0 | 1 | 2 | 3 | 4 |
| $f(x)$ |    |    |    |    |   |   |   |   |   |

(b) [10 pts] Graph  $f(x)$ .



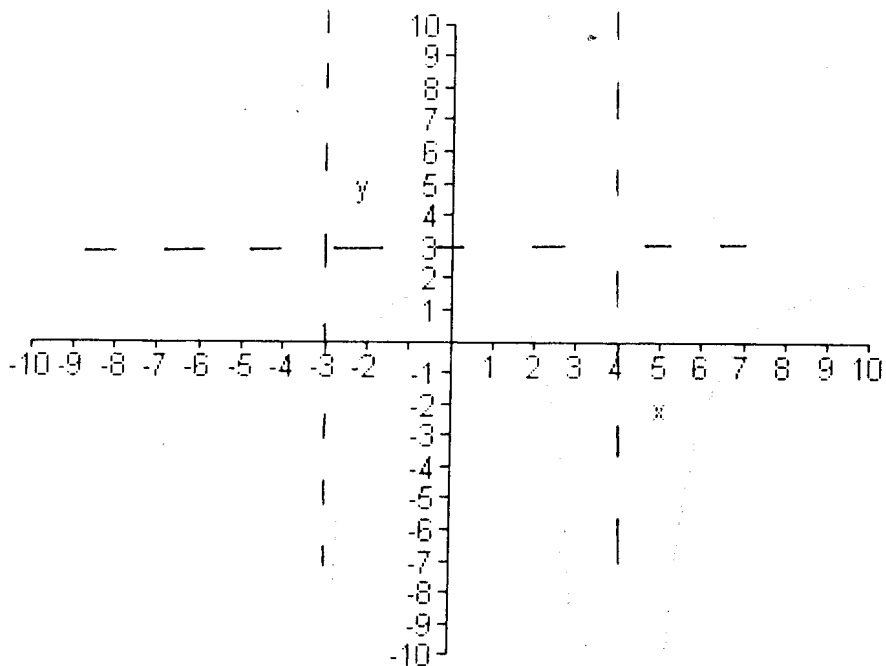
(c) [5 pts] What is the domain of  $f(x)$ ?

(d) [5 pts] What is the range of  $f(x)$ ?

(e) [1 pt] Does  $f(x)$  have an inverse function?

[5 pts] If so, what is it? If not, why?

(3) [25 pts] The following is a graph of the rational function  $f(x)$ : (note: the numerator and denominator of  $f(x)$  have integer coefficients)



(a) [5 pts] What are the zeros of  $f(x)$ ?

(b) [5 pts] What are the vertical asymptotes of  $f(x)$ ?

(c) [5 pts] What is the horizontal asymptote of  $f(x)$ ?

(d) [10 pts] What is a possible formula for  $f(x)$ ?

(4) [16 pts] Solve for  $x$ :

(a) [4 pts]  $\log(t + 35) = 2$

(b) [4 pts]  $\log(x^{3/2}) - \log\sqrt{x} = 4$

(c) [4 pts]  $e^{4x-3} = 21$

(d) [4 pts]  $5(1.031)^x = 8$

(5) [10 pts] Plutonium-238 (Pu-238) has a continuous annual rate of decay of roughly  
– .0079036 .

(a) [6 pts] What is the half-life of Pu-238?

(b) [4 pts] The Voyager 2 space craft, launched in 1977, has three nuclear power generators using Pu-238. Voyager 2 was launched with 72 pounds of Pu-238 and in 2020 it will no longer have enough Pu-238 to power its systems. At that time, how much Pu-238 will Voyager 2 have remaining?

(6) [19 pts] Let  $f(x) = -\frac{2}{3} \cos\left[\frac{\pi}{6}(x-2)\right] + 4$ .

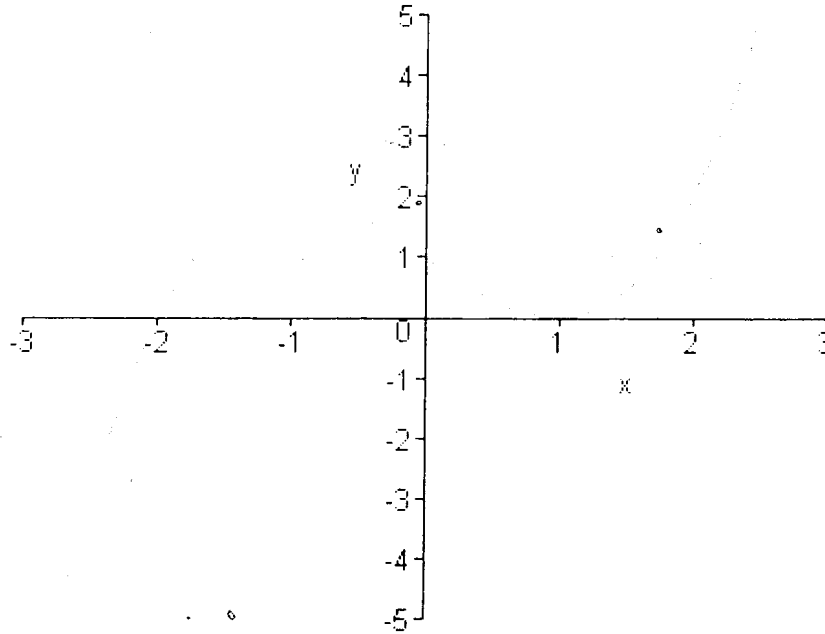
(b) [4 pts] What is the midline of  $f(x)$ ?

(c) [4 pts] What is the amplitude of  $f(x)$ ?

(d) [5 pts] What is the period  $f(x)$ ?

(e) [6 pts] Sketch the graph of  $f(x)$  and label on the grid below.

(7) [20pts] The following is a graph of the polynomial function  $f(x)$ :



(a) [5 pts] What are the zeroes of  $f(x)$ ?

(b) [5 pts] What is the  $y$ -intercept of  $f(x)$ ?

(c) [10 pts] What is a possible formula for  $f(x)$ ?

(8) [14 pts] Consider the equation of the function  $f(x) = -\frac{1}{2}(x-1)(x+2)$ .

(a) [6 pts] Write this function in standard form.

(b) [6 pts] Write this function in vertex form. (Hint: use completing the square.)

(c) [4 pts] Find the maximum value of  $f(x)$ .

Score \_\_\_\_\_ (150 points possible)