MATH 105 - SEC 001, FALL 2010. QUIZ 2
TIME LIMIT: 25 MINUTES

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Problem 1 (6 Points)

Line ℓ is given by $y = 4 - \frac{6}{7}\, x,$ and the point P has coordinates $(3, 4)$

(1) Find the equation of the line containing P and parallel to ℓ

The slope is the same as the one for ℓ, so $m = -6/7$. To find the y-intercept, we need to pug in the point P, so $4 = b - (6/7) * 3$. This implies $b = 46/7$. Then the equation is

$$y = 46/7 - (6/7)x$$

(2) Find the equation of the line containing P and perpendicular to ℓ

The slope here is $m = 7/6$. Similarly, we use P to find the y-intercept $4 = b + (7/6)3$, so $b = 1/2$. The equation for the line passing through P and perpendicular to ℓ is then

$$y = 1/2 + (7/6)x$$

(3) Graph the equations in parts (1) and (2)

Problem 2 (3 Points)

Let $f(x) = (x-1)^2 + \frac{x}{1-x}$. Find $f\left(1 - \frac{1}{t}\right)$.

Evaluating the function, we get

$$f(1-t) = (1 - 1/t - 1)^2 + \frac{1 - 1/t}{1 - (1 - 1/t)} = \frac{1}{t^2} + \frac{1 - 1/t}{1/t} = \frac{1}{t^2} + t - 1$$

Problem 3 (2 Points)

x	-1	0	1	2	3	
f(x)	0	-1	-4	5	-1	

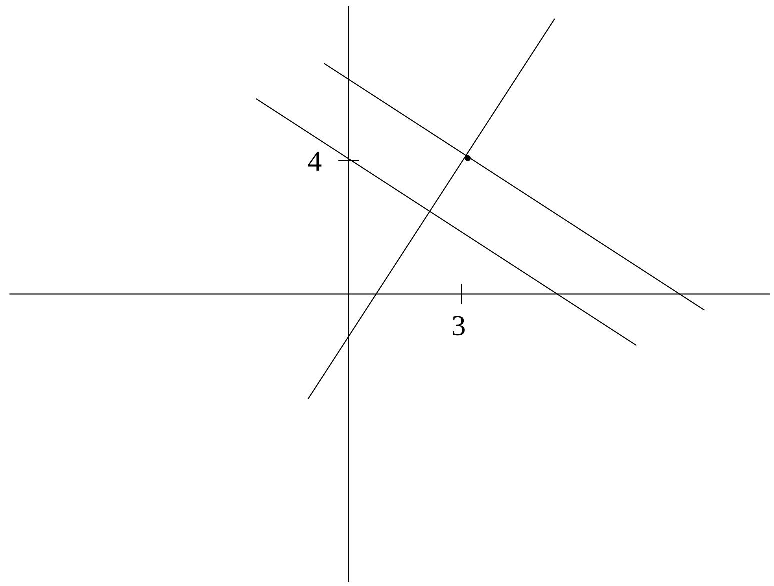
(1) Using the table above, evaluate $f(1)$, $f(0)$ and $f(3)$.

According to the table, f(1)=-4, f(0)=-1, f(3)=-1.

(2) Solve $f(x) = -1$ for x.

According to the table, the possible values for x are 0 and 3.

Date: September 22, 2010.



Problem 4 (5 Points)

Give a formula for a function that is undefined for $x = 8$ and for $x < 4$, but is defined everywhere else

We now $\sqrt{x-4}$ has domain all the values $x \geq 4$, and the function $\frac{1}{x-8}$ has domain all values $x \neq 8$. To get a function with the domain described above, we take the sum

$$f(x) = \sqrt{x-4} + \frac{1}{x-8}.$$

1. Problem 5 (6 Points)

An object's velocity at time t, where $t \geq 0$ is measured in seconds, is given by $v(t) = 1.6t^2 - 6.7t + 2.5$, where $v(t)$ is measured in meters per second. When the object's velocity is greater than zero, the object is moving in the eastward direction; when its velocity is negative, the object is moving in the westward direction. When does the object change directions? Estimate your answer(s) to two decimal places and show how you derived your answer(s).

The object changes direction when the velocity is zero. This is, when

$$v(t) = 1.6t^2 - 6.7t + 2.5 = 0$$

We use the quadratic formula to obtain all possible solutions

$$t = \frac{6.7 \pm \sqrt{(6.7)^2 - 4 * 1.6 * 2.5}}{2 * 1.6},$$

and so, $t = 3.77$ or $t = 0.41$.

Problem 6 (3 Points)

A restaurant us open from 2 pm to 2 am each day, and a maximum of 200 clients can fit inside. If $f(t)$ is the number of clients in the restaurant t hours after 2 pm each day, what are a reasonable domain and range of $f(t)$?

Since we are counting the number of hours after 2 pm, the domain is $[0, 12]$. Now, since $f(t)$ is the number of clients t hours after 2 pm, and the limit is 200 clients, the range consists of all integers between 0 (no clients) and 200 (maximum number of clients that fit in the restaurant). So the domain is $[0, 12]$ (in hours) and the range is $0, 1, 2, \ldots, 200$ clients.