

# Math 1005 exam 2

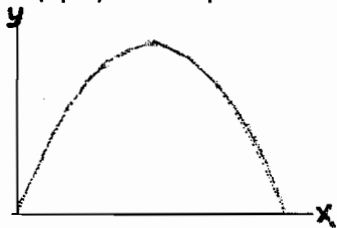
Please answer all questions carefully and show all of your work!

1. (4pts) Use the function  $f(x) = \begin{cases} x+1 & \text{if } x < 1 \\ 3-x & \text{if } x \geq 1 \end{cases}$  to evaluate

a)  $f(-2) = -2 + 1 = \boxed{-1}$

b)  $f(1) = 3 - 1 = \boxed{2}$

2. (4pts) Write a possible story that fits the graph. Be sure to label what each axis represents.



3. (10pts) Solve the following equations.

a)  $\frac{x+3}{2} - 1 = \frac{x-4}{3}$  LCD:  $2(3) = 6$

$$6\left(\frac{x+3}{2} - 1\right) = 6\left(\frac{x-4}{3}\right)$$

$$3(x+3) - 6 = 2(x-4)$$

$$3x + 9 - 6 = 2x - 8$$

$$3x + 3 = 2x - 8$$

$$-2x - 3 = -2x - 3$$

$$\boxed{x = -11}$$

b)  $\frac{6}{x+3} = -2 - \frac{2x}{x+3}$  LCD:  $(x+3)$   $x \neq -3$

$$(x+3)\left(\frac{6}{x+3}\right) = (x+3)\left(-2 - \frac{2x}{x+3}\right)$$

$$6 = -2(x+3) - 2x$$

$$6 = -2x - 6 - 2x$$

$$6 = -4x - 6$$

$$+6 \quad +6$$

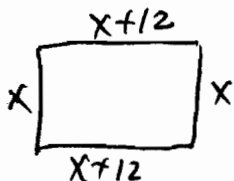
$$\frac{12}{-4} = \frac{-4x}{-4} \Rightarrow x = -3$$

but  $x \neq -3$  so  $\boxed{\text{no soln}}$

4. (6pts) The length of a room is 12 meters longer than the width. Given that the perimeter of the room is 156 meters, find the dimensions of the room. (Show all your work for full credit!)

$x = \text{width}$

$x+12 = \text{length}$



$$2(x) + 2(x+12) = 156$$

$$2x + 2x + 24 = 156$$

$$4x + 24 = 156$$

$$-24 \quad -24$$

$$\frac{4x}{4} = \frac{132}{4}$$

$$x = 33$$

width 33m  
length 45m

$33 + 12 = 45$

5. (8pts) Perform the operation and write in standard form.

a)  $2\sqrt{-16} + \sqrt{-25} = 2i\sqrt{16} + i\sqrt{25}$   
 $= 2i(4) + i(5) = 8i + 5i = \boxed{13i}$

b)  $\frac{(1-3i)(2+i)}{(2-i)(2+i)} = \frac{2+i-6i-3i^2}{4-i^2} = \frac{2-5i-3(-1)}{4-(-1)} = \frac{5-5i}{5}$   
 $= \frac{5(1-i)}{5} = \boxed{1-i}$

6. (6pts) Solve  $x^2 + 2x - 1 = 0$   
 quad formula  $a=1, b=2, c=-1$   
 $x = \frac{-2 \pm \sqrt{2^2 - 4(1)(-1)}}{2(1)}$   
 $= \frac{-2 \pm \sqrt{8}}{2} = \frac{-2 \pm 2\sqrt{2}}{2}$   
 $= \frac{2(-1 \pm \sqrt{2})}{2} = \boxed{-1 \pm \sqrt{2}}$

OR complete the sq.  
 $x^2 + 2x - 1 = 0$   
 $+1 \quad -1$   
 $x^2 + 2x = 1$   
 $(\frac{b}{2})^2 = (\frac{2}{2})^2 = (1)^2$   
 $x^2 + 2x + (1)^2 = 1 + (1)^2$   
 $(x+1)^2 = 2$   
 $\sqrt{(x+1)^2} = \pm\sqrt{2}$   
 $x+1 = \pm\sqrt{2}$   
 $-1 \quad -1$   
 $\boxed{x = -1 \pm \sqrt{2}}$

7. (6pts) Solve  $(x+4)^2 = 1$

$\sqrt{(x+4)^2} = \pm\sqrt{1}$   
 $x+4 = \pm 1$   
 $-4 \quad -4$   
 $x = -4 \pm 1 \rightarrow \boxed{x = -4+1} \quad \text{OR} \quad \boxed{x = -4-1}$   
 $\boxed{x = -3} \quad \boxed{x = -5}$

8. (6pts) Solve  $\sqrt{x+3} - x = 1$

$\sqrt{x+3} = x+1$   
 $(\sqrt{x+3})^2 = (x+1)^2$   
 $x+3 = x^2 + 2x + 1$   
 $-x \quad -3 \quad -x \quad -3$   
 $0 = x^2 + x - 2$   
 $0 = (x+2)(x-1)$   
 $x+2=0 \quad \text{OR} \quad x-1=0$   
 ~~$x = -2$~~   $\boxed{x = 1}$

9. (6pts) Solve  $x^4 - 2x^2 - 3 = 0$

$2(2)=4$   
 $(x^2)^2 - 2(x^2) - 3 = 0$   
 let  $u = x^2$   
 $u^2 - 2u - 3 = 0$   
 $(u-3)(u+1) = 0$   
 $u-3=0 \quad \text{OR} \quad u+1=0$   
 $u=3 \quad \quad \quad u=-1$   
 $x^2 = 3 \quad \quad \quad x^2 = -1$   
 $\boxed{x = \pm\sqrt{3}} \quad \quad \quad \boxed{x = \pm i}$

10. (6pts) Solve  $|2x - 1| \leq 1$ . Write your answer in interval notation.

$-1 \leq 2x - 1 \leq 1$   
 $+1 \quad +1 \quad +1$   
 $0 \leq 2x \leq 2$   
 $\frac{0}{2} \leq \frac{2x}{2} \leq \frac{2}{2}$   
 $0 \leq x \leq 1$   
 $\boxed{[0, 1]}$

11. (6pts) You are choosing between two telephone plans for local calls. Plan A charges \$25 per month plus \$0.04 per call. Plan B has a monthly fee of \$18 per month with a charge of \$0.05 per local call. How many local telephone calls in a month make plan A the better deal?

$x = \# \text{ calls}$

Plan A cost < Plan B cost

$$25 + 0.04x < 18 + 0.05x$$

$$-18 \quad -0.04x \quad -18 \quad -0.04x$$

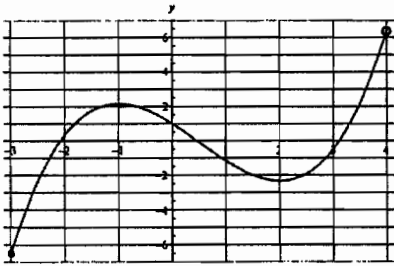
$$\frac{7}{0.01} < \frac{0.01x}{0.01}$$

$$700 < x$$

$$x > 700$$

Plan A is a better deal when make more than 700 calls

12. (16pts) Use the graph of  $f$  given below to answer the following questions. Approximate values if necessary.



a) domain  $[-3, 4]$

b) range  $[-6.5, 6.5]$

c)  $x$  - intercepts

$$x = -2.1, 0.5, 3.1$$

d)  $y$  - intercepts

$$y = 1$$

e) intervals of increase

$$(-3, -1) \cup (2, 4)$$

f) intervals of decrease

$$(-1, 2)$$

g) relative min value(s)

$$-2.3$$

h) relative max values(s)

$$2.1$$

13. (5pts) Write the equation of the line passing through the points  $(1, -2)$  and  $(2, 3)$  in slope-intercept form.

$$m = \frac{3 - (-2)}{2 - 1} = \frac{5}{1} = 5$$

$$y - 3 = 5(x - 2) \quad \text{OR}$$

$$y - (-2) = 5(x - 1)$$

$$y - 3 = 5x - 10$$

$$y + 2 = 5x - 5$$

$$\boxed{y = 5x - 7}$$

$$\boxed{y = 5x - 7}$$

14. (5pts) Find the equation of the line parallel to  $y - 2 = -4(x + 1)$  that passes through the point  $(1, 2)$ . Write the equation in point-slope form.

$$m = -4$$

parallel lines have same slope, so

$$m = -4, \text{ pt } (1, 2)$$

$$\boxed{y - 2 = -4(x - 1)}$$

15. (6pts) Sketch the following graph  $2x - 3y + 6 = 0$

using intercepts:

$$x\text{-int: } 2x - 3(0) + 6 = 0$$

$$2x + 6 = 0$$

$$2x = -6$$

$$x = -3$$

$$y\text{-int: } 2(0) - 3y + 6 = 0$$

$$-3y + 6 = 0$$

$$-3y = -6$$

$$y = 2$$

OR solve for  $y$

$$2x - 3y + 6 = 0$$

$$-2x \quad -6 \quad -2x \quad -6$$

$$\frac{-3y}{-3} = \frac{-2x - 6}{-3}$$

$$y = \frac{2}{3}x + 2$$

