

**MATH 121-003 — TEST III***PLEASE READ THESE INSTRUCTIONS:*

Problems have varying point values, indicated next to each problem and problem part. Do as many problems as you like – any points over 100 you earn will count as extra credit.

If you want credit for an answer, you **must** show your work – a correct answer without accompanying (and correct and readable) explanation will likely receive **zero credit**.

You may use a graphing calculator, but **not** a calculator (such as the TI-89) capable of symbolic manipulation. You may not use your book or notes.

*[Please do not write in the boxes below:]*

*PLEASE TURN OFF YOUR CELL PHONE.*

(from <http://www.xkcd.com>)

1 :	/5	
2 :	/5	
3 :	/10	
4 :	/10	
5 :	/10	
6 :	/10	
7 :	/10	
8 :	/10	
9 :	/10	
10 :	/10	
11 :	/16	
12 :	/14	
13 :	/12	
$\Sigma$ :	/132	

$\binom{2 \times a + 2 \times b +}{c+d}$  1Suppose that  $f(x) = 4x - 1$  and  $g(x) = -2x + 5$ .(a) What is  $f(0)$ ?(b) What is  $g(0)$ ?(c) Solve  $f(x) = 0$ .(d) Solve  $g(x) = 0$ .(e) Solve  $f(x) = g(x)$ .(f) Graph  $f(x)$  and  $g(x)$  on the same axes. Make sure to indicate which is which. Indicated clearly the  $x$ - and  $y$ -intercepts of each – label them clearly. Indicate clearly which is the point that represents the solution to the equation  $f(x) = g(x)$ , also noting its  $x$ - and  $y$ -coordinates.

$(a+b+c+d)$  **2**

A small bicycle manufacturer has fixed daily costs of \$1800 and can make each bicycle for \$90.

(a) Write down a (linear) function which expresses the cost  $C(b)$  of manufacturing  $b$  bicycles in one day.

(b) Graph this function  $C(b)$ . Make sure to label the axes clearly and completely.

(c) What is the cost of manufacturing 14 bicycles in one day?

(d) How many bicycles could be manufactured in one day for \$3780?

(a) **3**

A manufacturer of gas clothes driers has found that, when the unit price is  $p$  dollars, the revenue is  $R(p) = -4p^2 + 4000p$  dollars. What unit price should be set to maximize revenue? What will be that maximum revenue?

$(a+b+c+d+e)$  4

Let  $f(x) = 2x^2$  and  $g(x) = 2x + 3$ . In order to solve  $g(x) \geq f(x)$  perform the following steps:

(a) What is the slope of  $g(x)$ ? Its  $y$ -intercept?

(b) What is the vertex of  $f(x)$ ? Does it open up or down [how do you know]? What are its  $x$ - and  $y$ -intercepts? What is its axis of symmetry?

(c) Solve  $g(x) = f(x)$ .

(d) Graph  $f(x)$  and  $g(x)$  on the same axes, clearly labeling all intercepts of these graphs with the axes and with each other.

(e) Looking at your graph, write here the (interval notation for) the solution to the inequality  $g(x) \geq f(x)$ .

(a+b) **5** Say  $f(x) = 3x + 2$  and  $g(x) = 2x^2 - 1$ .  
(a) What is  $(f \circ g)(2)$ ?

(b) What is  $(g \circ f)(2)$ ?

(a) **6** Is the function  $f(x) = x^2$  one-to-one? Which test tells if it is, and how do you apply this test?

(a) **7** Are the functions  $f(x) = 9x - 9$  and  $g(x) = \frac{1}{9}x + 1$  inverses of each other? How do you know?

(a) **8** Solve  $2^{(7+3x)} = \frac{1}{4}$ .

- (a) **9** Express  $\log_2 \frac{17\sqrt{m}}{n}$  as simply as possible, using the log rules.
- (a) **10** [Regularly compounded interest satisfies  $A = P \left(1 + \frac{r}{n}\right)^{nt}$ , continuously compounded is  $A = Pe^{rt}$ .]  
(a) To what size does an investment of \$50 grow when left for three years in an account having an interest rate of 6%, compounded monthly?
- (b) In how many years will an investment of \$10,000 grow to \$25,000 when in an account that earns 6% interest, compounded continuously?
- (a) **11** [Radioactive decay obeys  $A(t) = A_0 e^{kt}$ . The “half-life” is the period of time required for any starting amount to decay to half of its original size.]  
Silicon-32 has a half-life of 710 years. How much is left of a sample which started at 70 grams after 400 years? [Hint: pick some random starting amount and use the definition of the half-life to write down an equation. Solve that equation for  $k$ . Then use  $k$  to plug in for the quantity of the chosen sample after 400 years.]