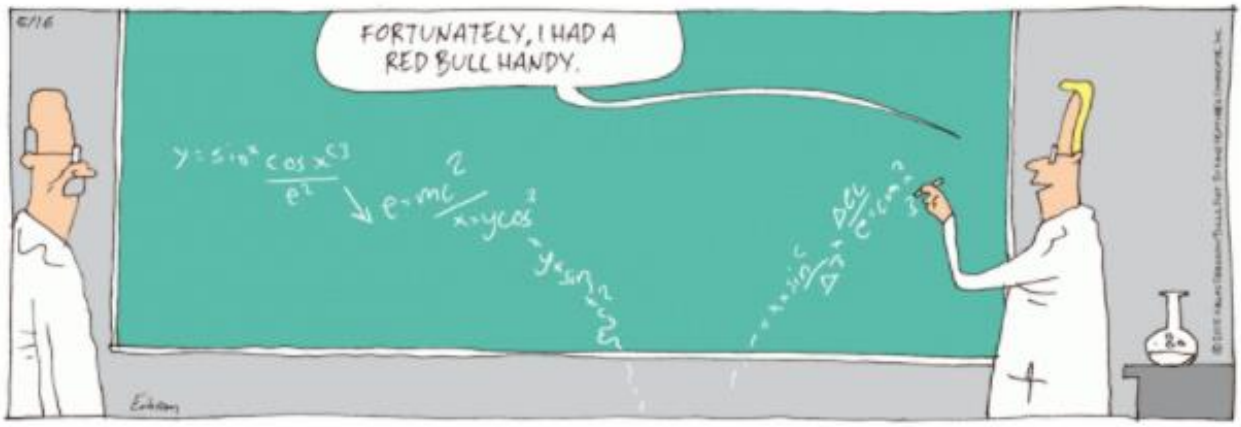
MATH 117 PRACTICE TEST IV 17 APRIL 2018

This test will cover sections 5.1, 5.2, and 8.1 (only 2 variables) of our textbook.



1. Let $h(x) = \sqrt{2018 + \frac{4}{x^2+77}}$. We wish to represent

$h(x)$ as a composition of two functions, viz $h(x) = f \circ g\,(x)$

(a) If f(x) = $\sqrt{x}$ find g(x).

(b) If g(x) = $\frac{4}{x^2+77}$ *find f.*

(c) If f(x) = $\sqrt{2018 + x}$ find g.

(d) If g(x) = $x^2 + 77$ find f.

2. Find functions f and g, each simpler than the given function h, such that $h(x) = f \circ g\,(x)$.

(a) $h(x) = \sqrt{2x+1}$

(b) $h(x) = (x^4 + 4)^{13}$

(c) $h(x) = \dfrac{5}{x+99}$

(d) $h(x) = \sqrt{\dfrac{x+4}{x+3}}$

(e) $h(x) = 4\sqrt{x}$

(f) $h(x) = \sqrt[3]{1+4x}$

(g) $h(x) = \dfrac{1+x^3}{2-4x^3}$

(h) $h(x) = \sqrt{\dfrac{99x}{2018+1}}$

3. Which of the following functions are *one-to-one*?

(a) $f(x) = x^3 + 1$

(b) $y = 9 + x^4$

(c) $h(x) = \sqrt{x^8+4}$

(d) $y = 33x^7 + 5x^3 + 9x + 1789$

(e) $y = (xy = x^5(x-7)(x+9)^3$

4. Find the inverse of each of the following invertible (that is, one-to-one) functions:

(a) $y = 4x - 9$

(b) $y = mx + b$, where $m \neq 0$

(c) $y = 5 + \sqrt[3]{x+5}$

(d) $f(x) = 5(x-7)^2 + 1,\ where\ x \geq 7$

(e) $y = \dfrac{x}{1-3x}$

(f) $g(x) = \dfrac{4x+1}{3x-5}$

5. Let $g(x) = \dfrac{x}{1+x}$ Find $g^{-1}(x) and\ verify\ that\ g \circ g^{-1}(x) = x$ $and\ that\ g^{-1} \circ g(x) = x$

6. Let f(x) = 3x + 1, g(x) = x^2 – 1, and h(x) = 7x.

Find:

(a) $g \circ h \circ f\,(x)$

(b) $f \circ h \circ g\,(x)$

(c) $f \circ f \circ f\,(x)$

(d) $h \circ g \circ f\,(x)$

(e) $g \circ g \circ g\,(-1)$

7. Using the method of Gaussian elimination (not substitution) solve each of the following systems of equations:

1. $3x+4y=10,$ $4x+y=9.$	**2.** $x+2y=13,$ $3x+y=14.$	**3.** $4x+7y=29,$ $x+3y=11.$
4. $2x-y=9,$ $3x-7y=19.$	**5.** $5x+6y=17,$ $6x+5y=16.$	**6.** $2x+y=10,$ $7x+8y=53.$
7. $8x-y=34,$ $x+8y=53.$	**8.** $15x+7y=29,$ $9x+15y=39.$	**9.** $14x-3y=39,$ $6x+17y=35.$
10. $28x-23y=33,$ $63x-25y=101.$	**11.** $35x+17y=86,$ $56x-13y=17.$	**12.** $15x+77y=92,$ $55x-33y=22.$
13. $5x-7y=0,$ $7x+5y=74.$	**14.** $21x-50y=60,$ $28x-27y=199.$	**15.** $39x-8y=99,$ $52x-15y=80.$
16. $5x=7y-21,$ $21x-9y=75.$	**17.** $6y-5x=18,$ $12x-9y=0.$	**18.** $8x=5y,$ $13x=8y+1.$
19. $3x=7y,$ $12y=5x-1.$	**20.** $19x+17y=0,$ $2x-y=53.$	**21.** $93x+15y=123,$ $15x+93y=201.$

8. The bees on Albertine's farm make honey. Over the first two weeks of May, the high temperature has been increasing each day, but the amount of honey the bees have been making decreases each day. Suppose $T(d)$ is the high temperature on the d^{th} day of May in degrees Celsius. Let $H(d)$ be the number of gallons of honey produced by the bees on the d^{th} day of May.

a. Give a *practical interpretation* of $T^{-1}(14) = 12$ in the context of this problem. *Do not use the language of mathematics.*

b. Give a *practical interpretation* of $T(H^{-1}(13)) = 10$.

c. Compare the two quantities given by putting one of the symbols "<", ">", or "=" in each blank provided. If the relationship between the quantities cannot be determined, write "*N*" in the blank.

$T(5)$ ___ $T(8)$

$H^{-1}(5)$ ___ $H^{-1}(8)$

$H(T^{-1}(9))$ ___ $H(T^{-1}(7))$