

Minitest 1A - MTH 1310

Dr. Graham-Squire, Fall 2014

Name: _____

Key

3:57

$\frac{4:03}{12}$

→ 36 min

I pledge that I have neither given nor received any unauthorized assistance on this exam.

(signature)

DIRECTIONS

1. Show all of your work and use correct notation. A correct answer with insufficient work or incorrect notation will lose points.
2. Clearly indicate your answer by putting a box around it.
3. Cell phones and computers are not allowed on this test. Calculators are allowed on the first 3 questions of the test, however you should still show all of your work. No calculators are allowed on the last 4 questions.
4. Give all answers in exact form, not decimal form (that is, put π instead of 3.1415, $\sqrt{2}$ instead of 1.414, etc) unless otherwise stated.
5. If you need to use the quadratic formula, it is $\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$.
6. Make sure you sign the pledge.
7. Number of questions = 7. Total Points = 30.

1. (4 points) Sneaky Weasels Finance Company is planning to expand to new locations 2 years from now. As a result, Sneaky Weasels' total deposits over the next 5 years are given by the function:

$$f(t) = \begin{cases} \sqrt{2t} + 20 & \text{if } 0 \leq t \leq 2 \\ \frac{1}{2}t^2 + 20 & \text{if } 2 < t \leq 5 \end{cases}$$

where $f(t)$ is measured in millions of dollars with $x = 0$ corresponding to the start of 2014.

- (a) What will the deposits be at the start of 2015?

2015 is $t = 1$ $\Rightarrow f(1) = \sqrt{2(1)} + 20 = 20 + \sqrt{2} \approx 21.4142$ \rightarrow round to nearest whole number thousand

$$\Rightarrow \$2,414,000$$

- (b) What will the deposits be at the start of 2018?

2018 $\rightarrow t = 4$ $\Rightarrow f(4) = \frac{1}{2}(4^2) + 20$
 $= 28$

$$\Rightarrow \$28,000,000$$

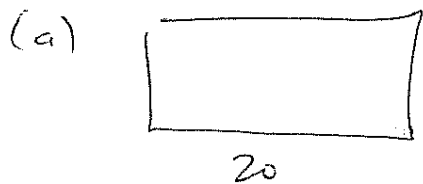
2. (6 points) Wendy wants to make a rectangular garden bed in her backyard, and she wants it to have an area of 100 ft^2 . She needs to figure out the dimensions of the rectangle so she can buy enough electrical fencing to keep the deer out.

(a) If the length of the garden bed is 20 feet, how many feet of fencing will she need to buy?

(b) If the length of the garden bed is x feet, how many feet of fencing will she need to buy? Your answer should be an expression in terms of x .

(c) ~~What is the domain of the function from part (b)?~~

$$\text{Area} = 100 \text{ ft}^2$$



$$\text{length} = 20, \quad A = l \cdot w$$

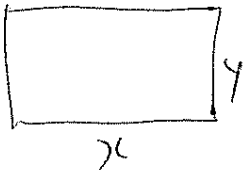
$$\frac{100}{20} = \frac{20 \cdot w}{20}$$

$$w = 5$$

\Rightarrow will need

$$2 \cdot 5 + 2 \cdot 20 = \boxed{50 \text{ feet of fencing}}$$

(b) $A = xy \Rightarrow 100 = xy \Rightarrow y = \frac{100}{x}$



$$\text{fencing} = 2x + 2y$$

$$f(x) = 2x + 2\left(\frac{100}{x}\right) = \boxed{2x + \frac{200}{x}}$$

(c) ~~$x > 0$ (no upper bound)~~

3. (2 points) Find the roots of the equation by either factoring or using the quadratic formula. Show your work!

$$5x^2 + 8x - 4 = 0$$

$$(5x - 2)(x + 2) = 0$$



$$5x - 2 = 0$$

or

$$x + 2 = 0$$

$$5x = 2$$

$$x = -2$$

$$x = \frac{2}{5}$$

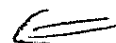
or

NO CALCULATOR

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4. (4 points) Answer the following:

(a) Simplify the expression as much as possible: $(\frac{2^6 \cdot 2^{-5}}{2^4})^{1/3}$



$$= \left(\frac{2^1}{2^4} \right)^{1/3}$$

$$= \left(\frac{1}{2^3} \right)^{1/3} = \frac{1^{1/3}}{(2^3)^{1/3}} = \boxed{\frac{1}{2}}$$

$$= (2^{-3})^{1/3} = \boxed{2^{-1}}$$

(b) Let $f(x) = x^2 - 2x + 3$. Find $f(3+h)$, and simplify the expression by multiplying out expressions and combining like terms.

$$f(3+h) = (3+h)^2 - 2(3+h) + 3$$

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

$$= 9 + 6h + h^2 - 6 - 2h + 3$$

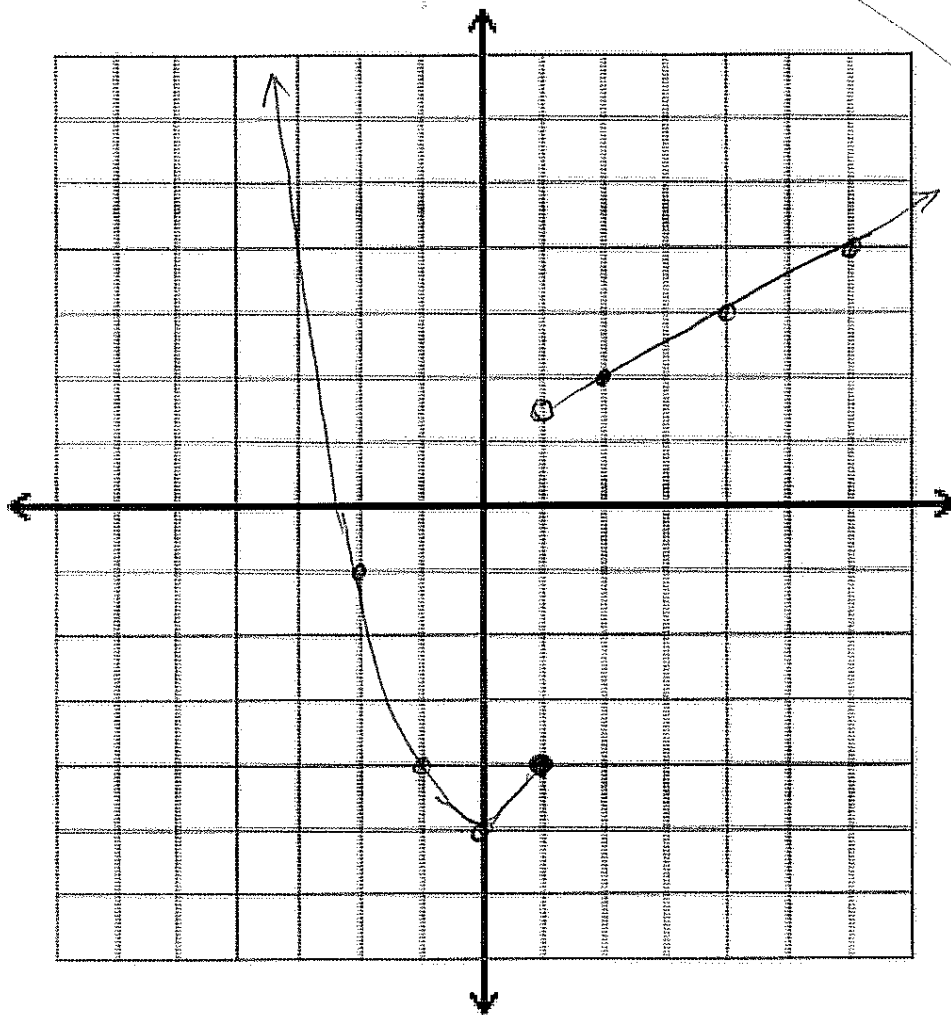
$$= \boxed{h^2 + 4h + 6}$$

5. (5 points) Sketch a graph of the function

$$f(x) = \begin{cases} x^2 - 5 & \text{if } x \leq 1 \\ \frac{1}{2}x + 1 & \text{if } x > 1 \end{cases}$$

x	$x^2 - 5$
-1	-4
0	-5
1	-4
-2	-1

Be sure to appropriately label the parts of the graph.



x	$\frac{1}{2}x + 1$
1	$\frac{3}{2}$ ← open circle
2	2
3	3
4	4

6. (5 points) The demand and supply equations for a company selling Nido Qubein bobble heads are, respectively:

$$p = -2x + 27$$

$$p = x^2 - 5x + 17$$

where p is the price in dollars, and x is the quantity measured in units of a thousand. Find the equilibrium price and quantity.

$$-2x + 27 = x^2 - 5x + 17$$

$$0 = x^2 - 3x - 10$$

$$0 = (x - 5)(x + 2)$$

$$\Rightarrow x = 5 \quad \text{or} \quad x = -2$$

So equil. quantity is 5000

↑ makes no sense
X

$$p = -2(5) + 27$$

$p = \$17$

↳ Darn good price for a Nido bobblehead!

7. (4 points) (a) Find an equation for the line that goes through the points $(-1, 1)$ and $(3, 3)$.

(b) Is the point $(4, 5)$ on the line as well?

Graphing the lines may help, but you do not need to graph them to get a correct answer.

x, y
 $(3, 3)$

$$(a) \quad m = \frac{3-1}{3-(-1)} = \frac{2}{4} = \frac{1}{2}$$

equation: ~~2~~

$$y - 3 = \frac{1}{2}(x - 3)$$

$$y = \frac{1}{2}x - \frac{3}{2} + 3$$

$$y = \frac{1}{2}x + \frac{3}{2}$$

$$(b) \quad 5 \stackrel{?}{=} \frac{1}{2}(4) + \frac{3}{2}$$

$$5 \stackrel{?}{=} \frac{7}{2} \quad \boxed{\text{No}}$$

Extra Credit(1 point) Let $f(x) = \sqrt{8-x^2}$ and $g(x) = x^4 + 5$. Calculate $g(f(3))$.

$$f(3) = \sqrt{8-3^2} = \sqrt{8-9} = \sqrt{-1} \quad \text{dne}$$

which does not exist.

So $g(f(3))$ dne