Midterm Two Study Guide Solutions
Up to 5 points extra credit for correct solutions

Due: Monday 3/30 at 11:10
No Late Work Accepted

Name Leslie Solorzano

Directions: Show all work and simplify your answers for full credit.

1. Perform the indicated operation. Simplify if possible.

a) $2\sqrt[3]{3a^4} - 3a\sqrt[3]{81a}$

(3·3·3)

$2a\sqrt[3]{3a} - 9a\sqrt[3]{3a}$

$-7a\sqrt[3]{3a}$

b) $\frac{\sqrt[4]{48}}{5x} - \frac{2\sqrt[4]{3}}{10x}$

(2·2·2·3)

(2) $\frac{2\sqrt[4]{3}}{5x} - \frac{2\sqrt[4]{3}}{10x}$

$\frac{4\sqrt[4]{3}}{10x} - \frac{2\sqrt[4]{3}}{10x} = \frac{2\sqrt[4]{3}}{10x}$

not necessary

$\frac{1\sqrt[4]{3}}{5x}$ $\frac{\sqrt[4]{3}}{5x}$

c) $(3x - \sqrt{2})^2$

$(3x-\sqrt{2})(3x-\sqrt{2})$

$9x^2 - 3x\sqrt{2} - \sqrt{2}\cdot 3x + \sqrt{2}\sqrt{2}$

$9x^2 - 6x\sqrt{2} + 2$

$9x^2 - 6x\sqrt{2} + 2$

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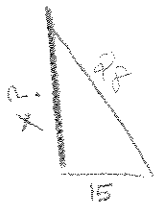
Name Frank Lenahan

Directions: Show all work and simplify your answers for full credit.

2. A wire is to be attached to support a telephone pole. Because of surrounding buildings, sidewalks, and roadways, the wire must be anchored exactly 15 feet from the base of the pole. Telephone company workers have only 30 feet of cable, and 2 feet of that must be used to attach the cable to the pole and to the stake on the ground. How high from the base of the pole can the wire be attached?

a) Draw a picture of the problem and point to what exactly you are trying to find.



The number of feet above the ground that the wire is going to attach to the pole.

b) Translate the problem into math & solve the problem.

$x^2 + 15^2 = 28^2$

$x^2 + 225 = 784$

$-225 \quad -225$

$x^2 = 559$

$x = \sqrt{559}$

$x \approx 23.6432$

c) Answer the question in a complete sentence.

The wire will attach with the pole ≈ 23.6432 feet above the base of the pole.

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Name Devin McFarland

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3. Solve.

a) $8x^2 - 2x = 7$

$8x^2 - 2x = 7$
$-7 \quad -7$
$8x^2 - 2x - 7 = 0$

$\frac{b \pm \sqrt{b^2 - 4ac}}{2a}$

$\frac{2 \pm \sqrt{(-2)^2 - 4(8)(-7)}}{2(8)}$

$\frac{2 \pm \sqrt{4 + 4(8)(7)}}{16}$

$\frac{2 \pm \sqrt{4 + 4(56)}}{16}$

$\frac{2 \pm \sqrt{4 + 224}}{16}$

$\frac{2 \pm \sqrt{228}}{16}$

$\frac{2 \pm 15.0997}{16}$

$x = 1.0687$ or $x = -.8187$

$= \frac{1 \pm \sqrt{57}}{8}$

b) $\frac{1}{3}x^2 - x - \frac{1}{6} = 0$

6

$\frac{b \pm \sqrt{b^2 - 4ac}}{2a}$

$\frac{1 \pm \sqrt{1^2 - 4(\frac{1}{3})(-\frac{1}{6})}}{2(\frac{1}{3})}$

$\frac{1 \pm \sqrt{1 + 4(\frac{1}{3})(\frac{1}{6})}}{2/3}$

$\frac{1 + \sqrt{1 + 4(\frac{1}{18})}}{2/3}$

$\frac{1 \pm \sqrt{1 + 2/9}}{2/3}$

$\frac{1 \pm \sqrt{11/9}}{2/3}$

$\frac{1 \pm 1.1055}{2/3}$

$x = 3.1583$ or $x = -.1583$

$2x^2 - 6x - 1 = 0$

$x = \frac{6 \pm \sqrt{44}}{4}$

$x = \frac{6 \pm 2\sqrt{11}}{4}$

Simplified: $x = \frac{3 \pm \sqrt{11}}{2}$

c) $5x^2 - 3 = 14x$

$5x^2 - 3 = 14x$
$-14x \quad -14x$

$5x^2 - 14x - 3 = 0$

$(5x + 1)(x - 3)$

$5x + 1 = 0$ or $x - 3 = 0$

$\frac{5x}{5} = \frac{-1}{5}$ or $x = 3$

$x = -\frac{1}{5}$ or $x = 3$

can also use quadratic formula...

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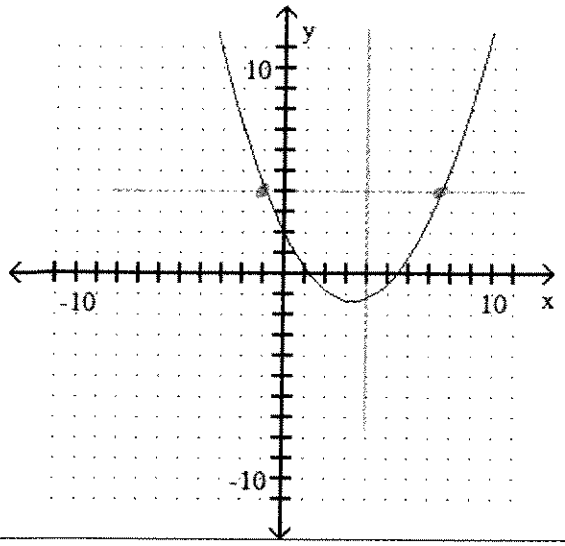
Name Uriel Mendoza

Directions: Show all work and simplify your answers for full credit.

4. Circle the following functions are one to one.

A.



How can you tell if this function is one to one or not?

It has to pass the vertical and horizontal line test. It passes the vertical line test, but fails the horizontal line test. So it is ~~not~~ a one to one function.

B.

Month of 1999 (input)	Jan	Feb	Mar	Apr	May	Jun
Sales of Product B (output)	3469	3979	3129	3809	4149	3979

How can you tell if this function is one to one or not?

For each input it has to be just one output, and for each output has to be only one input value.

The outputs for February and June are the same. So it is ~~not~~ a one to one function.

C.

f = {(6, 0), (0, 1), (-2, 2), (-4, 0)}

How can you tell if this function is one to one or not?

For each x value it has to be only one y value, and for each y value it has to be only one x value. The values y for the point (6,0) and (-4,0) are the same so it cannot be a one to one function.

D.

f = {(4, 7), (-7, -4), (6, 2), (-6, -2)}

How can you tell if this function is one to one or not?

It is a one to one function because there is a single x value to a y value, and a single y value to each x value.

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Name Edgar Molina

Directions: Show all work and simplify your answers for full credit.

5. Find the inverse of each function.

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

$y = \sqrt[3]{x+1}$

$y^3 = x+1$

$x = y^3 - 1$

$y = x^3 - 1$

$f^{-1}(x) = x^3 - 1$

b) $f(x) = \dfrac{5}{3x+1}$

$y = \dfrac{5}{3x+1}$

$x = \dfrac{5}{3y+1}$

$(3y+1)x = 5$

$3xy + x = 5$

$3xy = 5 - x$

$3x$

$f^{-1}(x) = \dfrac{5-x}{3x}$

c) $f(x) = 5x + 2$

$y = 5x + 2$

$\dfrac{y-2}{5} = x$

$f^{-1}(y) = \dfrac{y-2}{5}$

or

$f^{-1}(y) = \dfrac{x-2}{5}$

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Name Joseph Calderon

Directions: Show all work and simplify your answers for full credit.

6. If $f(x) = 2x + 4$, show that $f^{-1}(x) = \frac{x-4}{2}$

$f\left(\frac{x-4}{2}\right) = 2\left(\frac{x-4}{2}\right) + 4$

$x - 4 + 4$

$f\left(\frac{x-4}{1}\right) = \boxed{x}$

$f^{-1}(2x+4) = \frac{(2x+4)-4}{2}$

$\frac{2x+4-4}{2}$

$\frac{2x}{2}$

$f^{-1}(2x+4) = \boxed{x}$

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Name Andrew Preimesberger

Directions: Show all work and simplify your answers for full credit.

7. Find the equation for each table.

a)

x	0	1	2	3
$f(x)$	4	2	1	0.5

$f(x) = 4\left(\frac{1}{2}\right)^x$

b)

x	0	1	2	3
$f(x)$	5	7	9	11

$f(x) = 2x + 5$

8. Write the following expressions in equivalent exponential or logarithmic form. (Fill in the blanks).

Exponential form	**Logarithmic Form**
$5^3 = 125$	$\log_5 125 = 3$
$2^3 = x$	ln 3 = x

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03/30/09

Name Maria Fregoso

Directions: Show all work and simplify your answers for full credit.

9. Write the expressions *as sums or differences of multiples* of logarithms.

a) $\log_7 \frac{9x^2}{y}$

$\log_7 9 + \log_7 x^2 - \log_7 y$

$\log_7 9 + 2\log_7 x - \log_7 y$

b) $\log_6 \frac{5y}{z^2}$

$\log_6 5 + \log_6 y - \log_6 z^2$

$\log_6 5 + \log_6 y - 2\log_6 z$

c) $\log_b \sqrt{\frac{3}{y}}$

$\log_b \sqrt{\frac{3}{y}} = \log_b \left(\frac{3}{y}\right)^{1/2} = \frac{1}{2}\log_b \frac{3}{y} = \frac{1}{2}(\log_b 3 - \log_b y)$

$= \frac{1}{2}\log_b 3 - \frac{1}{2}\log_b y$

11. Use log rules and/or your calculator to find the four decimal approximations of the following logs. Show your work.

a) $\log_5 \frac{2}{3}$

$\frac{\log_{10} 2/3}{\log_{10} 5} = \frac{\log 2/3}{\log 5} = -0.2519$

b) $\ln 10^{4.2}$

$= 9.6709$

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Name Ahmed Shehade

Directions: Show all work and simplify your answers for full credit.

10. Solve each equation for x. Give an exact solution *and* a four-decimal place approximation.

a) $3^{2x+1} = 6$

$\log 3 \quad \log 3$

$2x+1 = \log_3 6$

$\frac{\log 6}{\log 3} = 2x+1$

$\frac{\log 6}{\log 3} - 1 = 2x$

$\frac{\frac{\log 6}{\log 3} - 1}{2} = \frac{2x}{2}$

$\frac{\log 6 - 1}{2 \log 3} = x$

$x = .3155$

Exact: $\left(\frac{\log 6 - 1}{2 \log 3}\right) = x$ or $\frac{\log 6}{2 \log 3} - \frac{1}{2}$

Approx: $x = .3155$ 1.7131

b) $\log_4 10 - \log_4 x = 2$

$\log_4 \frac{10}{x} = 2$

$4 \quad x \cdot \frac{10}{x} = 4^2 \rightarrow 16 \cdot x$

$\frac{10}{16} = \frac{16x}{16}$

$\frac{10}{16} = x$

Exact: $\frac{10}{16} = x$ Simplify $x = 5/8$

Approx: $.625 = x$

c) $\ln 3 + \ln (x - 1) = 0$

$\ln 3x - 3 = 0$
$e \qquad e$

$3x - 3 = 1$
$+3 \quad +3$

$3x = 4$
$3 \quad 3$

$x = 4/3$

$x = 1.\overline{33}$

Exact: $x = 4/3$

Approx: $x = 1.\overline{33}$

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Name Tristan Sheldon

Directions: Show all work and simplify your answers for full credit.

12. The compound interest formula is $A = P\left(1 + \frac{r}{n}\right)^{nt}$ where n represents the number of times interest is compounded each year, P is the initial deposit, r is the annual interest rate, t is the number of years, and A is the amount accrued.

a) Clearly define your variables.

N = Interest compounded each year
P = Initial deposit
R = Annual interest rate
T = Number of years
A = amount accrued

b) How long will it take a $1000 investment to earn $150 in interest if it is invested in an account that pays 9% interest compounded quarterly? Write your answer in a complete sentence.

A = 1150
P = 1000
R = .09
N = 4
t = ?

$A = P\left(1 + \frac{r}{n}\right)^{nt}$

$1150 = 1000\left(1 + \frac{.09}{4}\right)^{4t}$

$\frac{1150}{1000} = \frac{1000}{1000}(1.0225)^{4t}$

$1.15 = (1.0225)^{4t}$

$\log 1.15 = \log 1.0225^{4t}$

$\frac{\log 1.15}{4 \log 1.0225} = \frac{4t(\log 1.0225)}{4 \log 1.0225}$

$t = \frac{\log 1.15}{4 \log 1.0225}$

$t = 1.57$

It takes about 1.5 years for the initial deposit of $1000 to earn $150 in interest with a rate of 9%.

c) If you deposit $500 into an account that pays 6% interest compounded monthly, how much money will you have in 7 years? Write your answer in a complete sentence.

A = ?
P = 500
R = .06
N = 12
T = 7

$A = P\left(1 + \frac{r}{n}\right)^{nt}$

$A = 500\left(1 + \frac{.06}{12}\right)^{12(7)}$

$A = 500\left(1 + \frac{.06}{12}\right)^{84}$

$A = 760.1848 \rightarrow 760.18$

In 7 years you will have $760.19 with an initial deposit of $500 and an interest rate of 6%.

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Name Jesse Slater

Directions: Show all work and simplify your answers for full credit.

13. Retail revenue from shopping on the internet is currently growing at a rate of 56% per year. In 2000, a total of $42.1 billion in revenue was collected through internet retail sales. Answer the following questions using $y = 42.1(1.56)^t$ where y is internet revenue in billions of dollars and t is the number of years after 2000. Round answers to the nearest tenth of a billion dollars.

Write your answers in complete sentences.

a) Clearly define your variables.

y = internet revenue in billions
t = number of yrs after 2000

b) According to the model, what were the retail revenues from internet shopping in 2001?

$y = 42.1(1.56)^1$

65.676 billion

In 2001 the internet revenues will reach 65.676 billion dollars if the rate of profit is 56% each year

In ~~2001 the total~~

c) What will the internet shopping revenues be in 2010?

$y = 42.1(1.56)^{10}$

3593.59 billion

In 2010 the internet revenues will reach 3593.59 billion dollars if the rate of profit is 56% each year

d) When will the internet shopping revenues be $100 billion?

$\frac{100}{42.1} = \frac{42.1(1.56)^t}{42.1}$

$\frac{1}{t}\left(\frac{100}{42.1}\right) = \left((1.56)^t\right)^{1/t}$

$1.231317 = \frac{1.56}{1}$

2.148

The internet revenues will reach 100 billion dollars in the year 2002