

NO CALCULATORS on these, unless you want to use them to **CHECK** your work.

Problems circled in red have pencasts posted.

Question 1. First some algebra...

(a) Simplify:

$$\left(\frac{3x^{3/2}y^3}{x^2y^{-1/2}}\right)^{-2} = \frac{x}{9y^7}$$

(b) Simplify:

$$\frac{x^2}{x^2-4} - \frac{x+1}{x+2} = \frac{1}{x-2} \quad \text{and}$$

$$\frac{\frac{y}{x} - \frac{x}{y}}{\frac{1}{y} - \frac{1}{x}} = -y-x$$

(c) Solve the following equations:

(a) $x^2 - x - 12 = 0$ $x=4, x=-3$

(b) $x^2 - x = 13$ $x = \frac{1+\sqrt{53}}{2}, x = \frac{1-\sqrt{53}}{2}$

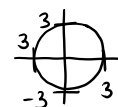
(c) $x^2 - x + 12 = 0$ no real solutions

Question 2. A bit of geometry.

(a) Find an equation for a horizontal line through the point $(2, -5)$. $y = -5$

(b) Find an equation for a line through the point $(2, -5)$ that is parallel to the line $2x - 4y = 3$. $y = \frac{1}{2}x - 6$

(c) Sketch the graph of the equation $x^2 + y^2 = 9$. Is it the graph of a function?



Not a function, fails vertical line test

Question 3. Working with functions.

(a) If $f(x) = x^3$, evaluate and simplify $\frac{f(2+h)-f(2)}{h}$. $12 + 6h + h^2$

(b) Find the domain of $g(x) = \frac{\sqrt[3]{x}}{x^2+1}$. all real numbers

(c) Is $g(x) = \frac{\sqrt[3]{x}}{x^2+1}$ an even function, an odd function, or neither?

(d) If $f(x) = x^2 + 2x + 1$ and $g(x) = 2x - 3$, find $f \circ g$. $(f \circ g)(x) = 4x^2 - 8x + 4$
Composition

(e) Find the inverse of the function

$$f(x) = \frac{4x-1}{2x+3} \quad f^{-1}(x) = \frac{-1-3x}{2x-4}$$

Question 4. This will come back to haunt you in a few weeks...

Solve the following equation. (Hint: Start by factoring.)

$$(x+1)^{-4}(3)(x+5)^2 + (-4)(x+1)^{-5}(x+5)^3 = 0 \quad x = -5, x = -17$$

Question 5. Basic trig skills

(a) Sketch the following curves for $-2\pi \leq x \leq 2\pi$, including period, amplitude, and asymptotes (where relevant): $y = \sin x, y = \cos x, y = \tan x, y = \sec x, y = \csc x, y = \cot x$ see textbook or D2L review materials

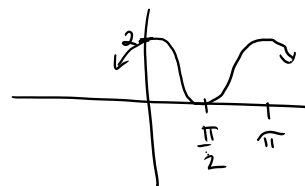
(b) Write $\tan x, \cot x, \sec x,$ and $\csc x$ in terms of sine and cosine. see Trig

(c) Evaluate $\sin \pi/6, \cos(-3\pi/4), \tan 7\pi/3, \cot(-\pi/3), \sec \pi/2,$ and $\csc \pi$.

OVER $\frac{1}{2}$ $-\frac{1}{\sqrt{2}} = -\frac{\sqrt{2}}{2}$ $\sqrt{3}$ $-\frac{1}{\sqrt{3}} = -\frac{\sqrt{3}}{3}$ \uparrow undefined \uparrow

Question 6. Making friends with trig functions.

- (a) Find all values of x such that $\sin^2 x + 1 = 2 \sin x$. $x = \frac{\pi}{2} + 2\pi k$, where k is any integer
(for example, $\frac{\pi}{2}, -\frac{3\pi}{2}, \frac{5\pi}{2}$, etc.)
- (b) Sketch the graph of $f(x) = 1 + \cos 2x$.
- (c) Simplify: $2 \sin^2 x + 2 \cos^2 x - 1 = 1$



Question 7. You need to know your trig forwards AND backwards...

- (a) Evaluate: $\tan^{-1} 1$, $\arcsin(-\frac{1}{2})$, and $\sec^{-1} \sqrt{2}$
- (b) Sketch the graph of $y = \sin^{-1} x$ and $y = \tan^{-1} x$. See inverse trig reference
- (c) Find an equivalent algebraic expression (so no trig functions allowed!) for $\cos(\sin^{-1} x)$. $\sqrt{1-x^2}$

Question 8. And who could forget exponential and logarithmic functions?

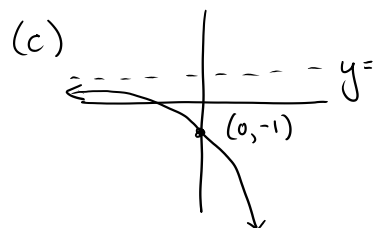
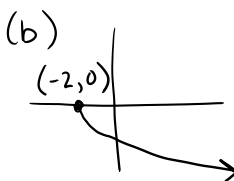
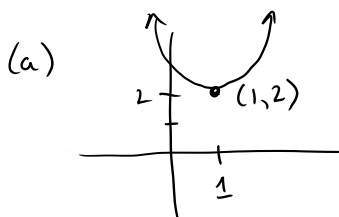
- (a) Simplify the following:
- (a) $\ln e^{\sin x} = \sin x$
- (b) $\log_2 \frac{1}{8} = -3$
- (c) $\ln 8 - \ln 2 = \ln 4$
- (d) $e^{x+\ln(5)} = 5e^x$
- (b) Sketch the graph of $y = \ln x$, $y = (\frac{1}{2})^x$, $y = e^x$, and $y = e^{-x}$. see graph reference
- (c) Find the domain, range, x - and y -intercepts of $f(x) = \frac{e^x+2}{x-1}$. Domain: $(-\infty, 1) \cup (1, \infty)$ x -int: none
 y -int: -3
- (d) Find the domain, range, x - and y -intercepts of $f(x) = \sqrt{\ln(x-1)}$. Domain: $(2, \infty)$ x -int: 2
 y -int: none
- (e) If $f(x) = e^{2x} - 3e^x + 1$, find $f(0)$ and $f(\ln 2)$.
 $f(0) = -1$ $f(\ln 2) = -1$

Question 9. Use properties of logarithms to expand the following into a sum, difference, and/or multiple of logarithms.

- (a) $\ln\left(\frac{x \sin x}{\sqrt{x+2}}\right) = \ln x + \ln \sin x - \frac{1}{2} \ln(x+2)$
- (b) $\ln(e^x \sqrt{x} \cos x)^3 = 3\left(x + \frac{1}{2} \ln x + \ln(\cos x)\right)$

Question 10. Graph transformations.

- (a) Sketch the graph of the function $f(x) = (x-1)^2 + 2$.
- (b) Sketch the curve $y = -\sqrt{x+2}$.
- (c) Sketch the graph of the function $f(x) = -2e^x + 1$.



Notes:

We will be using these skills RIGHT AWAY. **The first 35 points of Exam 1 will cover the topics on this review and on Worksheet 2.** The *types* of problems you will see will be like the ones on the two review sheets, but you should expect them to be slightly different. If you had some trouble with these problems, here's where to go for some help to get yourself ready for the exam - and more importantly, for calculus:

- **“Review Materials” folder on D2L:** There are lots of materials available here:
 - Pencasts (like videos) on some review topics, including solutions to some of the questions from this worksheet.
 - Some handouts that you may wish to print out and study.
 - Some additional worksheets - one helping with vocabulary, and one highlighting common mistakes students make.
 - Information about how to access WeBWorK, a free online homework program that has some problems very similar to these. **If you want more practice problems like the ones on Worksheets 1 and 2, I recommend starting here.**
- **“Chapter 0” in your textbook:** If you prefer pencil-and-paper problems, you can find some more review exercises there.
- **<http://www.khanacademy.org/>** - This is a GREAT RESOURCE to keep in mind for the whole semester. You can find lots of videos here with explanations and worked problems. It covers algebra, precalculus, calculus, and more - including almost all of the topics we will cover this semester.
- **My office** - In particular, I can offer a pretty effective 5-7 minute review of how to evaluate trig functions if you have forgotten.
- **Supplemental Instruction sessions:** They should be starting soon, so be watching for the schedule to be posted. Joshua will be a great resource for us!
- **The SMART Center:** Free tutoring on both campuses! Check their website (link on D2L) for more information.
- **Your Algebra/Trig textbook** - If you know the areas you're having trouble with, go find the related sections there and work some problems. If you don't still have yours, the library is full of them.

I expect many of you may be rusty on some of these skills - that is normal, and with a little practice between now and next week, you will be fine. However, if you are having a LOT of trouble with these problems, **YOU WILL HAVE A TOUGH SEMESTER.** You may want to consider registering for MATH 1113 instead. At the very least, plan to spend a **MINIMUM** of 12 hours per week on this class. Pencil in a visit to office hours and/or an SI session and/or the tutoring center at least twice a week. Come see me if you have concerns, or want input on whether Calc 1 is the right place for you right now.