

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

Question 1. Some geometry we will need

- (a) Find an equation for a horizontal line through the point $(2, -5)$.
- (b) Find an equation for a line through the point $(2, -5)$ that is parallel to the line $2x - 4y = 3$.
- (c) What is the area of a circle with radius 3? What is the circumference?
- (d) Sketch the graph of the equation $x^2 + y^2 = 9$. Is it the graph of a function?
- (e) A triangle T_1 has side lengths 3, 5, and 7. If a second triangle T_2 is similar to T_1 and it has side lengths 9, 15, and x , find x .

Question 2. Make trigonometry your friend!

- (a) Write $\tan x$, $\cot x$, $\sec x$, and $\csc x$ in terms of sine and cosine.
- (b) Evaluate (if possible): $\sin \pi/6$, $\cos(-3\pi/4)$, $\tan 7\pi/3$, $\cot(-\pi/3)$, $\sec \pi/2$, and $\csc \pi$.
- (c) Evaluate: $\tan^{-1} 1$, $\arcsin(-\frac{1}{2})$, and $\sec^{-1} \sqrt{2}$
- (d) Simplify: $2 \sin^2 x + 2 \cos^2 x - 1$
- (e) Simplify: $\frac{\sec x}{\tan x}$
- (f) If $\tan \theta = \frac{3}{4}$, find $\cos \theta$.
- (g) Find an equivalent algebraic expression (so no trig functions allowed!) for $\cos(\sin^{-1} x)$. Hint: Mimic what you did in the previous question.

Question 3. Working with functions

- (a) If $f(x) = x^2 + 4$, evaluate and simplify $\frac{f(2+h)-f(2)}{h}$.
- (b) Find the domain of $g(x) = \frac{\sqrt[3]{x}}{x^2+1}$.
- (c) If $f(x) = x^2 + 2x$ and $g(x) = \sin x$, find $g \circ f$ and $f \circ g$.

Question 4. Exponential and Logarithmic functions

- (a) Simplify the following:
 - (a) $\ln e^{\sin x}$
 - (b) $\log_2 \frac{1}{8}$
 - (c) $\ln 8 - \ln 2$
 - (d) $e^{x+\ln(5)}$
- (b) Find the domain of $f(x) = \frac{\ln(x+2)}{x-1}$ and $g(x) = \sqrt{e^x + 1}$.
- (c) If $f(x) = e^{2x} - 3e^x + 1$, find $f(0)$ and $f(\ln 2)$.

Question 5. Simplifying

(a) Subtract: $\frac{1}{x} - \frac{1}{\sin x}$

(b) Rewrite in terms of fractional exponents, and then simplify:

$$\frac{3\sqrt{x^3y^3}}{x^2\sqrt{y}}$$

(c) Rewrite so that there are no fractions (but negative exponents are OK):

$$\frac{1 - \sqrt{x}}{x^3}$$

(d) Simplify the following:

(i) $\frac{x^2 \cdot \frac{1}{x} - 2x \ln x}{(x^2)^2}$

(ii) $\frac{\frac{3}{x}}{\frac{y}{x^2}}$

(e) Write the following expression so that there is no root in the numerator, and then simplify.

$$\frac{\sqrt{x+h} - 1 - (\sqrt{x} - 1)}{h}$$

(f) Solve for z in the following and simplify:

$$2x + 2yz = \frac{x^2 \cdot 4yz - 2y^2 \cdot 2x}{(x^2)^2}$$

(g) Solve for z in the following and simplify:

$$2xy + x^2z = e^{xy}(y + xz)$$

Question 6. Solve the following equations:

(a) $x^2 - x - 12 = 0$

(b) $x^2 - x = 13$

(c) $x^2 - x + 12 = 0$

(d) $x - x^{1/3} = 0$

(e) $(x + 1)^{-4}(3)(x + 5)^2 + (-4)(x + 1)^{-5}(x + 5)^3 = 0$ (hint: start by factoring)

(f) $\cos x = \frac{1}{2}$ on $[0, 2\pi]$

(g) $\sin^2 x + 1 = 2 \sin x$ on $[-2\pi, 2\pi]$

(h) $xe^x - e^x = 0$

(i) $x \ln x + x = 0$

Question 7. Sketch each of the following. Include both positive and negative x values, and also include intercepts and asymptotes (where applicable).

(a) $y = x^2$, $y = x^3$, $y = \sqrt{x}$, $y = \frac{1}{x}$

(b) $y = \sin x$, $y = \cos x$, $y = \tan x$, $y = \sec x$, $y = \csc x$, $y = \cot x$, $y = \tan^{-1} x$

(c) $y = e^x$, $y = \ln x$, $y = \left(\frac{1}{2}\right)^x$, $y = e^{-x}$

Question 8. Suppose

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

(a) Sketch the graph of $f(x)$.

(b) Find $f(-2)$, $f(1)$, and $f(5)$.

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

(a) $\ln\left(\frac{x \sin x}{\sqrt{x+2}}\right)$

(b) $\ln(e^x \sqrt{x} \cos x)^3$

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.
- **“Chapter 0” and “Appendix A” 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.
- **The SMART Center:** Free tutoring on both campuses! Check their website (link on course page) 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.