

Homework Rules and Suggestions

Suggestions:

1. Assigned homework is given to aid you in learning the material covered in class and gain expertise at carrying out the type of mathematics you will be required to do on tests. I strongly suggest that you do the homework.
2. Since the assignments are online, having someone else do your homework is certainly an option but good scores on home is no excuse for poor performance on exams. By doing math you get better at it. The little mistakes that plague students usually disappear with practice. I strongly suggest that you do your own homework. Although working in a group is not discouraged as long as you are an active participant and completely understand what you enter in Webwork.
3. Doing homework when it is assigned and covered in class is very important. Unfortunately many students put off homework until it is due. This is a mistake for several reasons. First, I cover examples exactly like homework exercises in class (more on that in the rules) so it is easiest to do the problems when the material is fresh on your mind. Second, we continue to cover new material everyday and very soon all the methods and techniques will become a blur so it is best to do home right away.

Rules Concerning Homework:

1. I am very happy to help you with your homework and I encourage you to seek my help. without question the best way to do this is using email. All emails to me concerning a homework question **MUST** be sent to me directly from that particular question in webwork. In particular, on each exercise there is a button near the bottom of the screen that says "Email Instructor". If you want help on a webwork exercise you must use this button! If you email me during the day I will respond quickly. If you send email in the evening you will have a response by the next morning.
2. Work on the homework when it is assigned. If you wait until the last day to finish your homework you will not be able to count on my help. Any questions sent to me the evening an assignment is due will be ignored. Assignments are always open for at least a week so there is no excuse for putting off doing your homework. The deadlines for homework are not negotiable.
3. When you send email requesting help you should enter your work in the email (NO ATTACHMENTS) from the point where you do not have a correct answer. In other words, you need to send work to show me what you are doing that leads to the incorrect answer. Once I respond to an email you will understand what I mean.

Webwork: Homework will be assigned on each section covered using the online homework system Webwork. The link to your Webwork account can be found on the class webpage (see the syllabus). I suggest you bookmark the class webpage. To log in to Webwork your User Login Name is your **eraider name** (all lower case) and your Password is your **Rnumber** (including the capital R).

Algebra and Trigonometry Review

There are a number of very elementary mistakes commonly made by students that prevent them from obtaining correct answers. Among these are simple rules of exponents and other basic algebra. Here are a few examples:

1. Solve for y in $e^y = e^x + 1$. What many students do is apply the natural log (\ln) to both sides which is correct but at this point they make a terrible mistake and use a **Non-Existent Rule** $\ln(a + b) = \ln(a) + \ln(b)$ to get

$$y = \ln(e^x + 1) = \ln(e^x) + \ln(1) = x + 0 = x.$$

What you should get is $y = \ln(e^x + 1)$ which cannot be simplified.

2. Solve for y in $\ln(y) = \ln(x) + \ln(2)$. What many students do is exponentiate both sides which is correct but at this point they make a terrible mistake and use a **Non-Existent Rule** $e^{a+b} = e^a + e^b$ to get

$$y = e^{\ln(x)+\ln(2)} = e^{\ln(x)} + e^{\ln(2)} = x + 2.$$

What you should get is $y = e^{\ln(x)+\ln(2)}$ which can be simplified as follows. By the rules of exponents $e^{a+b} = e^a e^b$ so we would have $y = e^{\ln(x)+\ln(2)} = e^{\ln(x)} e^{\ln(2)} = 2x$.

3. Solve for y in $\tan(x + y) = \tan(x) + 1$. What many students will do is apply \tan^{-1} (also called arctan or atan) to both sides which is correct but at this point they make a terrible mistake and use a **Non-Existent Rule** $\arctan(a + b) = \arctan(a) + \arctan(b)$ to get

$$x + y = \arctan(\tan(x) + 1) = \arctan(\tan(x)) + \arctan(1) = x + \pi/4$$

since $\arctan(1) = \pi/4$. The above calculation simplifies to $y = \pi/4$ which is nonsense. What you should have is $x + y = \arctan(\tan(x) + 1)$ or $y = -x + \arctan(\tan(x) + 1)$ which cannot be simplified.

4. I could go on but I hope you get the point. You have got to be careful and not make up algebra rules on your own. Notice for example, if $\ln(a + b) = \ln(a) + \ln(b)$ were thru then $\ln(2) = \ln(1) + \ln(1) = 0$ which is not true. Similarly, if $e^{a+b} = e^a + e^b$ then $e^{1+(-1)} = e^1 + e^{-1}$ but the left hand side is $e^0 = 1$ and the right hand side is clearly not equal to 1.

Calculus Review

Probably the most abused mathematics in Advance Engineering Math (AEM) is differential and integral calculus. Folks, you have had 3 semesters of calculus and it is expected that you can take derivatives and evaluate integrals. In fact the main point of the material for test one will be algebra and integration. Virtually every exercise will involve doing integrals – usually more than one. The basic formulas for derivatives and integrals are listed below. These tables are **NOT** allowed on exams. You will need know these results and also the various techniques of integration including the many substitution methods.

Formulas for Derivatives

1. $c' = 0$
2. $x' = 1$
3. $(x^n)' = nx^{n-1}$
4. $(cf(x))' = cf'(x)$
5. $(f(x) \pm g(x))' = f'(x) \pm g'(x)$
6. $(f(x)g(x))' = f'(x)g(x) + f(x)g'(x)$
7. $\left(\frac{f(x)}{g(x)}\right)' = \frac{f'(x)g(x) - f(x)g'(x)}{g(x)^2}$
8. $(\sin(x))' = \cos(x)$
9. $(\cos(x))' = -\sin(x)$
10. $(\tan(x))' = \sec^2(x)$
11. $(\cot(x))' = -\csc^2(x)$
12. $(\sec(x))' = \sec(x)\tan(x)$
13. $(\csc(x))' = -\csc(x)\cot(x)$
16. $[f(g(x))]' = f'(g(x))g'(x)$
17. $\frac{dy}{dx} = \frac{dy}{du} \frac{du}{dx}$
18. $\forall r \in \mathbb{R}, (x^r)' = rx^{r-1}$
19. $(a^x)' = \ln(a)a^x$
20. $(\log_a(x))' = \frac{1}{\ln(a)x}$
21. $(\sin^{-1}(x))' = \frac{1}{\sqrt{1-x^2}}$
22. $(\cos^{-1}(x))' = \frac{-1}{\sqrt{1-x^2}}$
23. $(\tan^{-1}(x))' = \frac{1}{1+x^2}$
24. $(\cot^{-1}(x))' = \frac{-1}{1+x^2}$
25. $(\sec^{-1}(x))' = \frac{1}{|x|\sqrt{x^2-1}}$
26. $(\csc^{-1}(x))' = \frac{-1}{|x|\sqrt{x^2-1}}$

Formulas for Integrals

$$1. \int x^n dx = \frac{x^{n+1}}{n+1} + C, \quad n \neq -1$$

$$2. \int cf(x) dx = c \int f(x) dx$$

$$3. \int (f(x) \pm g(x)) dx = \int f(x) dx \pm \int g(x) dx$$

$$4. \int \cos(x) dx = \sin(x) + C$$

$$5. \int \sin(x) dx = -\cos(x) + C$$

$$6. \int \sec^2(x) dx = \tan(x) + C$$

$$7. \int \csc^2(x) dx = -\cot(x) + C$$

$$8. \int \sec(x) \tan(x) dx = \sec(x) + C$$

$$9. \int \csc(x) \cot(x) dx = -\csc(x) + C$$

$$10. \int e^x dx = e^x + C$$

$$11. \int \frac{dx}{x} = \ln(x) + C$$

$$12. \int a^x dx = \frac{a^x}{\ln(a)} + C$$

$$13. \int \frac{1}{\sqrt{1-x^2}} dx = \sin^{-1}(x) + C$$

$$14. \int \frac{1}{1+x^2} dx = \tan^{-1}(x) + C$$

$$15. \int \frac{1}{|x|\sqrt{x^2-1}} dx = \sec^{-1}(x) + C$$