Daily Procedures (Arrival) - Amended

1. Be in your assigned seat when the tardy bell rings.
   Failure to be in your seat, with your materials out, when the tardy bell rings is an automatic tardy. Three tardies result in an automatic 15 minute detention.
2. The answers to the previous day's work will be on the projector; grade your answers.
   2.1 Every problem should include the original question, your work, and the solution.
   Failure to show your work results in a zero for that problem.
   2.2 Write a check for every correct answer
   2.3 Circle every wrong answer

Notes

Daily Procedures (Arrival) - Amended - Cont.

3. At the top of your page, make sure that your name is written on the left, and on the right you should have three numbers:
   3.1 The number of problems there were
   3.2 The number of problems you answered
   3.3 The number of problems you got correct

   Record these numbers in your homework log.
4. After roll is taken, pass your work forward.
   Homework problems will not be discussed until your work is handed in.

Notes

Course Procedures - Amended

1. You can retake any unit test.
   Maximum score on a retake is 70%.
2. Every four weeks you may use one late and one excused homework pass.
   Late homework is due the following day, or will result in a zero.
3. If time remains after the daily lecture portion of the class, students are expected to work on their daily work.
   This is not a time for socializing.
4. Help is available after school on Tuesdays, Thursdays, and Fridays.

Notes

Reviewing the Derivative Rules

- $\frac{d}{dx} cx^n = cnx^{n-1}$
- $\frac{d}{dx} uv = u\frac{dv}{dx} + v\frac{du}{dx}$
- $\frac{d}{dx}\left(\frac{u}{v}\right) = \frac{v\frac{du}{dx} - u\frac{dv}{dx}}{v^2}$
- $\frac{d}{dx} \sin x = \cos x$
- $\frac{d}{dx} \cos x = -\sin x$
- $\frac{d}{dx} \tan x = \sec^2 x$
- $\frac{dy}{dx} = \frac{dy}{du} \cdot \frac{du}{dx}$
- $\frac{d}{dx} u^n = nu^{n-1}\frac{du}{dx}$
- $\frac{d}{dx} e^x = e^x$
- $\frac{d}{dx} \csc x = -\cot x \csc x$
- $\frac{d}{dx} \sec x = \tan x \sec x$
- $\frac{d}{dx} \cot x = -\csc^2 x$

Notes

Finding Slopes using the Chain Rule

Example (Find the slope of the line tangent to the curve $y = \sin^5 x$ at the point $x = \pi/3$)

$$\begin{aligned} \frac{dy}{dx} &= 5\sin^4 x \cdot \frac{d}{dx}\sin x \\ &= 5\sin^4 x \cos x \end{aligned}$$

$$\begin{aligned} \left.\frac{dy}{dx}\right|_{x=\pi/3} &= 5\sin^4(\pi/3)\cos(\pi/3) \\ &= 5\left(\frac{\sqrt{3}}{2}\right)^4\left(\frac{1}{2}\right) = \frac{45}{32} \end{aligned}$$

Notes

Arguing about slopes

Example (Show that the slope of every line tangent to the curve $y = \frac{1}{(1-2x)^3}$ is positive.)

$$\begin{aligned} \frac{dy}{dx} &= \frac{d}{dx}(1-2x)^{-3} \\ &= -3(1-2x)^{-4}\frac{d}{dx}(1-2x) \\ &= -3(1-2x)^{-4}(-2) \\ &= \frac{6}{(1-2x)^4} \end{aligned}$$

Note that the tangent line does not exist at $x = 1/2$.
Since the numerator and denominator are both positive, the slope must also be positive.

Notes

Expanding the Chain Rule

Example ($g(t) = \tan(5 - \sin 2t)$)

$g(t) = \tan u_1, \quad u_1 = 5 - \sin u_2, \quad u_2 = 2t$

Notes

Expanding the Chain Rule

Example ($g(t) = \tan(5 - \sin 2t)$)

$g(t) = \tan u_1, \quad u_1 = 5 - \sin u_2, \quad u_2 = 2t$

$$\begin{aligned} \frac{d}{dt}g(t) &= \frac{dg}{du_1} \cdot \frac{du_1}{du_2} \cdot \frac{du_2}{dt} & &= \sec^2(u_1) \cdot (-\cos(u_2)) \cdot 2 \\ & & &= -2\cos(2t)\sec^2(5 - \sin 2t) \end{aligned}$$

Notes

Expanding the Chain Rule

Example ($g(t) = \tan(5 - \sin 2t)$)

$g(t) = \tan u_1, \quad u_1 = 5 - \sin u_2, \quad u_2 = 2t$

$$\begin{aligned} \frac{d}{dt}g(t) &= \frac{dg}{du_1} \cdot \frac{du_1}{du_2} \cdot \frac{du_2}{dt} & &= \sec^2(u_1) \cdot (-\cos(u_2)) \cdot 2 \\ & & &= -2\cos(2t)\sec^2(5 - \sin 2t) \end{aligned}$$

Alternate notation using "outside in" approach:

$$\begin{aligned} \frac{d}{dt}g(t) &= \sec^2(5 - \sin 2t)\frac{d}{dt}(5 - \sin 2t) \\ &= \sec^2(5 - \sin 2t) \cdot (-\cos 2t \frac{d}{dt}(2t)) \\ &= \sec^2(5 - \sin 2t) \cdot (-\cos 2t \cdot 2) \\ &= -2\cos(2t)\sec^2(5 - \sin 2t) \end{aligned}$$

Notes

Pop Quiz Moment

Differentiate the following functions:

1. $y = (x^2 + 3x - 7)^4$
2. $y = \tan^3 x$
3. $y = \frac{4}{\sin^2 x + \cos^2 x}$

Notes

Pop Quiz Moment

Differentiate the following functions:

1. $y = (x^2 + 3x - 7)^4$ 1. $y' =$
2. $y = \tan^3 x$ 2. $y' =$
3. $y = \frac{4}{\sin^2 x + \cos^2 x}$ 3. $y' =$

Notes

Homework: Section 3.6 (page 153): 13 - 31 (10 problems)

13 $\frac{dy}{dx} =$
15 $\frac{dy}{dx} =$
17 $\frac{dy}{dx} =$
19 $\frac{dy}{dx} =$
21 $\frac{dy}{dx} =$
(Hint: simplify using $\sin a \cos b =$)
23 $\frac{dy}{dx} =$
25 $\frac{dr}{d\theta} =$
27 $\frac{dr}{d\theta} =$
29 $y'' =$
31 $y'' =$

Notes