Math 1823 homework

Instructions: Be able to work all of the assigned problems. Book problems shown in **boldface** should be written up formally and turned in no later than the due date.

12. (due 10/5) 3.1 # 4, **5, 6, 17**, 19-25, **35, 36**

13. (10/5) 3.2 # 1-14, **19, 21, 28, 46**

14. (10/12) 3.3 # 1-20, 23-34, **35, 36, 41-43**, 57, **58, 60, 61, 84, 87, 88**

15. (10/12) 3.5 # 1-7, **8, 12, 14, 16, 17**, 35-44, **46, 47**

16. (10/12) 3.6 # 7-10, **11-14**, 15-32, **33-35**, 36-38, **39-41**, 42, **52, 54, 55, 59, 63, 71, 73**

17. (10/19) 3.7 # 1-11, **12, 14, 21, 22, 28, 36, 40**

18. (10/19) 3.8 # 1, **2**, 5-20, **26, 27**, 34, 35, **36, 37, 53-56**

19. (10/26) 3.9 # 7, **8, 15, 16, 22**, 26, **26**, 31, **34, 38**

20. (10/26) Verify that $\dfrac{d}{dx}(\tan^{-1}(x)) = \dfrac{1}{1+x^2}$ as follows:

    1. Graph $y = \tan(x)$ for $-\pi/2 < x < \pi/2$. Declare that this is the graph of $x = \tan^{-1}(y)$. Notice that then, $\tan(\tan^{-1}(y)) = y$.
    2. In a new coordinate system, graph $y = \tan^{-1}(x)$. What is $\lim\limits_{x\to\infty} \tan^{-1}(x)$?What is $\lim\limits_{x\to-\infty} \tan^{-1}(x)$?
    3. Differentiate both sides of the equation $\tan(\tan^{-1}(x)) = x$ with respect to x, and solve for $\dfrac{d}{dx}(\tan^{-1}(x))$.
    4. Use a right triangle with sides 1, x, and $\sqrt{1+x^2}$ to determine $\sec(\tan^{-1}(x))$, and thereby obtain the formula $\dfrac{d}{dx}(\tan^{-1}(x)) = \dfrac{1}{1+x^2}$.

21. (11/9) Verify part 2. of "Local effect of f'", using a direct argument (that is, not by deducing it from part 1., but by using an argument analogous to the one we used in class to verify part 1). Here is the statement of part 2:

    2. If $f'(a) < 0$, then there exists $\delta > 0$ so that
       (a) if $a < x < a + \delta$, then $f(a) > f(x)$, and
       (b) if $a - \delta < x < a$, then $f(x) > f(a)$.

22. (11/9) 4.1 # **7-14**, 22-34, **38, 41-44**, 45-50, **51, 52, 55-57**

23. (11/18) 4.2 # **3, 4, 6, 13-16, 18, 23, 26, 27, 29, 30**