Math 220: Calculus I
Worksheet 27
April 30, 2013

Today tutoring room 5-7
Office hours tomorrow 1-2
Tutorring room Thursday 5-7
Email anytime
Solutions are posted on Compass along with solutions to all other homework problems.
These problems are a sampling of homework problems from sections covered on Exams I and II.

1. (2.2 #11) Determine the values of a for which $\lim_{x\to a} f(x)$ exists.

$$f(x) = \begin{cases} 1+x & \text{if } x < -1 \\ x^2 & \text{if } -1 \le x < 1 \\ 2-x & \text{if } x \ge 1 \end{cases}$$

2. (2.2 #32) Determine the value of the limit $\displaystyle\lim_{x\to 5^-} \frac{e^x}{(x-5)^3}$.

3. (2.3 #25) Determine the value of the limit $\displaystyle\lim_{h\to 0} \frac{\sqrt{1+h}-\sqrt{1-h}}{h}$.

4. (2.3 #37) If $4x-9 \le f(x) \le x^2-4x+7$ for $x \ge 0$, find $\lim_{x\to 4} f(x)$.

5. (2.5) Precisely state the definition of what it means for a function to be continuous at a point.

6. (2.5 #49) If $f(x) = x^2 + 10\sin x$, show that there is anumber c such that $f(c) = 1000$.

7. (2.6 #24) Determine the value of the limit $\displaystyle\lim_{x\to -\infty} \frac{\sqrt{9x^6-x}}{x^3+1}$.

8. (2.7) Know how to do the Exam I Problem "Using proper notation and the limit definition of the derivative. . . ."

9. (3.x) Are you familiar with Liebnitz notation?

10. (3.1 #33) Find an equation of the tangent line to the curve $y = \sqrt[4]{x}$ at the point $(1, 1)$.

11. (3.2 #17) Differentiate $y = e^p(p + p\sqrt{p})$.

12. (3.3 #12) Differentiate $y = \frac{\cos x}{1-\sin x}$.

13. (3.4 #47) Find y' and y'' for $y = \cos(x^2)$.

14. (3.5 #15) Find $\frac{dy}{dx}$ by implicit differentiation for $e^{x/y} = x - y$.

15. (3.6 #45) Use logarithmic differentiation to find the derivative of $y = x^{\sin(x)}$.

16. (3.7 #10) A particle moves with a position function $s = t^4 - 4t^3 - 20t^2 + 20t$ for $t \ge 0$. At what time does the particle have a velocity of 20 m/s? At what time it he acceleration 0?

17. (3.8 #9) The half-life of cesium-137 is 30 years. Suppose we have a 100-mg sample. Find the mass that remains after t years. How much of hte sample remains after 100 yeras? After how long will only 1 mg remain?

18. (3.9 #15) Two cars start moving from the same point. One travels south at 60 mi/h and the other travels west at 25 mi/h. At what rate is the distance between the cars increasing two hours later?

19. (4.1 #53) Find the absolute max and min of $f(x) = x + \frac{1}{x}$ on the interval $[0.2, 4]$.

20. (4.3 #33) For $f(x) = x^3 - 12x + 2$, find intervals of increase or decrease, local max/min, intervals of concavity, and inflection points.

21. (4.7 #14) A box with square base and open top must have a volume of $32,000cm^3$. Find the dimensions of the box that minimize the amount of material used.

22. (4.4 #49) Evaluate $\lim_{x \to 1} \left(\frac{x}{x-1} - \frac{1}{\ln x} \right)$.

23. (4.4 #67) Using l'Hospital's Rule, evaluate $\lim_{x \to \infty} \left(1 + \frac{2}{x} \right)^x$.