Discussion Problems for Math 180

Tuesday, April 14, 2015

Review – take no more than five minutes per question.

1. (a) Use a linear approximation to the function $f(x) = \sqrt{x}$ to estimate $\sqrt{8}$.

    (b) Now use a linear approximation to the function $g(x) = 8/\sqrt{x}$ to estimate $\sqrt{8}$.

    (c) Are your answers overestimates or underestimates? What does this tell us about $\sqrt{8}$?

2. Find $\lim\limits_{x \to 0^+} \ln\left(\tan\left(x + \frac{\pi}{2}\right)\right)^x$.

3. If $f'(x) > 0$ on the interval $[a, b]$, which of the following are necessarily true?

    (a) $f(x)$ is positive on $[a, b]$.

    (b) If $a < x < b$ then $f(x) > f(a)$.

    (c) The slope of the tangent line to f at a point $a < x < b$ is increasing.

    (d) f is concave up on $[a, b]$.

    (e) $f(b) > f(a)$.

This time

4. (a) Sketch a graph of the function $f(x) = \sin(x)$.

    (b) What is the area under each of the humps?

5. Use a geometric argument to calculate $\int_2^4 3x + 5$.

6. If we take a (finite) left Riemann sum approximating the integral $\int_a^b \arctan(x)\,dx$, will we necessarily get an underestimate or an overestimate?

7. Determine the antiderivatives of $f(x) = x\sin(x)$. (This will require some creativity.)