Homework 4: Due Wednesday, September 28

This is the last homework before the test. There is no way we could grade it and get it back to you before the test, so we are collecting it after the test. You should make sure that you are doing these problems correctly before you take the test. This homework covers: higher derivatives (sec 3.7) (easy, if you understood hw’s 2 and 3); velocity and acceleration (sec 3.3, 3.7); tangent and normal lines (sec 3.1, 3.3, 3.6); graphing (sec 4.3, 4.5) (see my comments below); max-min theory problems, implicit differentiation with more than one unknown function (not explicitly covered in book, but it will help when you get to the story problems.)

sec 3.7 page 240: 1, 2, 3, 8, 14, 18, 29, 31, 45, 48, 59, 61, 67
sec 3.1 page 191: 39, 46, 49, 51, 52
sec 3.3 page 197: 1, 4, 6
sec 3.5 page 224: 46, 47, 51
sec 3.6 page 233: 26, 27
sec 4.3 page 304: 1, 2, just graph: 12, 15, 16, 17, 18, 19, 20, 49, 50
sec 4.5 page 323: 3, 7, 42, 44, 45, 46, 48

Test Review: Dave will run a test review on Sunday, Sept 25 in the lobby of Justin Hall starting at 6:30PM. It is possible that other instructors and campus organizations will also run reviews, so keep your eyes open.

Max-Min theory problems: Find the x-value(s) where the following functions attain a max or min on the indicated interval and find the max and min value(s) (or upper or lower bounds) where requested.

1. \( y = x^3 - 2x^2 + x \) on \([-1, 2]\)
2. \( y = x^4 - 4x \) on \([0, 2]\)
3. \( y = (x - 3)^{-2} \) on \((0, 4)\)
4. \( y = x + x^{-1} \) on \((0, \infty)\)
5. $y = \cosh x$ on $[-2, 2)$

Establish the following inequalities:

6. $\sin x < x$ on $(0, \infty)$.

7. $0 < e^{-x^2} \leq 1$ on $(-\infty, \infty)$

8. Let $a > 0$ be a constant. Show that $\sqrt{ax} \leq \frac{1}{2}(a + x)$ for $x \geq 0$

**Implicit differentiation problems:** Compute the required derivatives of the following expressions assuming that every variable in each expression (other than $e$ and $\pi$ of course) is a function:

9. $(D_t) a^2 + b^2 = c^2$

10. $(D_t) A = \ell w$

11. $(D_t) c^2 = a^2 + b^2 - 2ab \cos \gamma$

12. $(D_s) x = \frac{-b + \sqrt{b^2 - 4ac}}{2a}$

13. $(D_t) y = x \tan \alpha$

14. $(D_s) PV = nRT$

15. $(D_t) \cosh^5(\tan(pq) + 3\sqrt{2r})\arcsinh(e^{\csc^2 x}) = 6\pi^3$