Mth 31, Homework 11 on sections 4.8, 4.9

Due by Wed, Nov 26.

Write all your working out and answers clearly and neatly, using lots of space. Each question is worth 3 points.

Section 4.8 Newton's method

(1) Use Newton's method to approximate a solution to $x^2 - 5 = 0$ as follows:

- **(a)** Starting with $x_1 = 2$, find the second approximation x_2.
- **(b)** Then find the third approximation x_3.
- **(c)** Compare your answers with the decimal of the exact solution.

(2) Use Newton's method to estimate $\sqrt[3]{24}$ using at least two steps, in other words start with an initial guess x_1 and find x_2 and x_3.

(Hint: that is the solution of $x^3 - 24 = 0$ so take $f(x) = x^3 - 24$.)

(3) Use Newton's method to estimate $\sqrt[4]{19}$ using at least two steps.

(4) Explain how you could use Newton's method to get an approximation for e, the base of the natural logarithm.

(Hint: use the natural logarithm $\ln(x)$ somehow.)

Section 4.9 Antiderivatives

(5) Find the most general antiderivative of

$$g(x) = 6x^5 - 10x^4 + 3x^3 + 1$$

and check that your answer is correct by differentiating it and getting $g(x)$ again.

(6) Find the most general antiderivative of: $x^{2/5} - \dfrac{2}{x^4} + x\sqrt{x} - \dfrac{8}{x}$

(7) What is the most general antiderivative of: $3^x + \pi + \sin x - 4\sec^2(x)$

(8) Find $f(x)$ if

$$f'(x) = e^x + \sinh x + \frac{2}{\sqrt{1-x^2}} \qquad \text{and} \qquad f(0) = 3$$

(9) Find $f(x)$ if

$$f''(x) = 20x^3 + 8 \qquad \text{and} \qquad f(0) = 5,\ f(1) = 0$$

(10) The position of an object at time t is $s(t)$. Its velocity is $v(t)$ and its acceleration is $a(t)$. Find the formula for $s(t)$ if

$$a(t) = 5\cos t - 3\sin t \qquad \text{and} \qquad s(0) = 0,\ v(0) = 5$$

If you get stuck on a question or aren't sure if you understand it:

- Go over the relevant class notes and section in the textbook.
- Check if you get the right answer for a similar odd-numbered question in the textbook (answers at the back of the book).
- Ask me about it after class.
- Come to my office hours: Mon 11:30 - 12:30, Wed 11:30 - 12:30 in CP 317.
- Go to the Math Tutorial Lab in-person in CP 303 or online.