This homework is due on the last day of class, Monday, May 4.

1. Give the value of each of the following limits at infinity of rational functions. The answers can simply be stated, based on the theorem about such limits, using the degree of the numerator and the degree of the denominator. You do not need to show any work.

a) $\lim_{x\to\infty} \dfrac{x^7 - 2x^3 + 8}{3x^7 + 2x^2 + 1}$ **b)** $\lim_{x\to\infty} \dfrac{6x^2 + 1}{2x^6 + 1}$ **c)** $\lim_{x\to\infty} \dfrac{\pi x^3 + \frac{1}{2}x^2}{ex^3 - 3x + \frac{13}{3}}$

2. Compute each of the following limits, using L'Hôpital's rule. Some limits might require algebraic manipulation before applying the rule, if they are not already in the form $\frac{0}{0}$ or $\frac{\infty}{\infty}$.

a) $\lim_{x\to 0} \dfrac{\sin(x^2)}{\sin(2x)}$ **b)** $\lim_{x\to +\infty} \dfrac{\ln(3x+1)}{\ln(2x+1)}$

c) $\lim_{t\to 0^+} t^2 \ln(t)$ **d)** $\lim_{x\to 0} \dfrac{x - \sin(x)}{x^2}$

3. By computing a derivative, verify that $\displaystyle\int x\sin(x)\,dx = \sin(x) - x\cos(x) + C$.

4. Find each of the following indefinite integrals:

a) $\displaystyle\int x^3 + 3x^2 + x \; dx$ **b)** $\displaystyle\int \sqrt{x} + \sqrt[3]{t} \; dt$ **c)** $\displaystyle\int \sin(\theta) - \tan(\theta)\sec(\theta) \; d\theta$

d) $\displaystyle\int \frac{x^2+1}{x} \; dx$ **e)** $\displaystyle\int e^x + e^{-x} \; dx$