Part 3 of the review problems for final exam, Math 151, Sections 13, 14, 15

1. Evaluate the following limit of Riemann sums by any method you like:

$$\lim_{n\to\infty}\sum_{i=1}^{n}\left[\left(\frac{i}{n}\right)^2+\frac{2i}{n}\right]\frac{1}{n}.$$

2. Find the following indefinite and definite integrals:

   (a) $\displaystyle\int_5^6 \frac{dt}{(t-4)^2}$.

   (b) $\displaystyle\int \frac{e^{\sqrt{x}}}{\sqrt{x}}dx$.

   (c) $\displaystyle\int x^2\sqrt{1+x^3}dx$.

   (d) $\displaystyle\int_1^9 \frac{\sqrt{x}-2x^2}{x}dx$.

   (e) $\displaystyle\int(3e^x+7\sec^2 x+5(1-x^2)^{-\frac{1}{2}})dx$.

   (f) $\displaystyle\int_{\frac{4}{\pi}}^{\frac{3}{\pi}} \frac{1}{x^2}\sec^2\left(\frac{1}{x}\right)dx$.

3. Find the integral

$$\int_{-\pi}^{\pi}\frac{x^5+\tan x}{1+2x^2}dx$$

   without calculation.

4. Find the following derivatives:

   (a) $\displaystyle\frac{d}{dx}\int_1^{10x}\ln(t^4+3t^2+7)dt$.

   (b) $\displaystyle\frac{d}{dx}\int_1^{x^2}\sin(\cos(\sqrt{t}))dt$.

5. Find the areas bounded by the following curves:

   (a) $y=2x^2$ and $y=8x$.

   (b) $y=\sin x$ and $y=\cos x$, $0\le x\le\frac{\pi}{4}$.