Practice Problems for MAT 126 Spring 2016 Midterm 1

1) Find f given the following derivatives:

(a) $f'(x)=3x^2-5x+1$ and $f(0)=10$

(b) $f'(y)=4y^3+y^2+6y$ and $f(1)=0$

(c) $f'(\theta)=\sin\left(\frac{\pi}{4}\theta\right)+\frac{2}{\theta}$ and $f(1)=5$

(d) $f'(x)=\frac{e^x-e^{-x}}{2}$ and $f(0)=1$

(e) $f'(z)=3z^2-\frac{1}{\sqrt{z}}$ and $f(1)=4$

2a) If $f(x)=\int_2^x\left(5+t^2\right)dt$ find $f'(x)$, $f'(3)$ and $f(3)$

(b) If $g(x)=\int_2^x(\sin t)\,dt$ find $g'(x)$ and $g''(x)$

(c) If $f(x)=\int_{\cos x}^{\sin x}\sqrt{1-t^2}\,dt$ find $f'(3)$ and $f'\left(\frac{\pi}{4}\right)$

(d) If $h(x)=\int_{x^2}^{0}\left(t^3-1\right)dt$ find $h'(x)$, $h(0)$, and $h(1)$

(e) If $f(x)=\int_{\pi}^{x^2}\tan t\,dt$ find $f'(x)$ and $f'\left(\sqrt{\pi}\right)$

3) Evaluate the following integrals:

a) $\int_1^2 x^2 + 4x + \sqrt{x}\, dx$

(b) $\int e^x - \sec^2 x\, dx$

(c) $\int_1^{e^3} \frac{4}{x} dx$

(d) $\int \sec x \sqrt{1 + \tan^2 x}\, dx$

(e) $\int_1^4 \pi^2 dx$

(f) $\int \cos^9 x \sin x dx$

(g) $\int x e^{x^2} dx$

(h) $\int \frac{2x}{x^2 + 1} dx$

(i) $\int \frac{\cos\left(\sqrt{x}\right)}{\sqrt{x}} dx$

(j) $\int \tan^3 x \sec^2 x dx$

4a) Given the function $f(x) = x^2 - 16$:

(i) Approximate the area between the curve and the *x*-axis on the interval $[1,3]$ using $n = 4$ left hand rectangles

(ii) Write a formula for the Riemann Sum using right hand rectangles.

(iii) Compute the limit of the Riemann Sum either by using integration or by computation.

(b) Given the function $f(x) = x^3 + 4$:

(i) Approximate the area between the curve and the *x*-axis on the interval $[1,7]$ using $n = 3$ right hand rectangles

(ii) Write a formula for the Riemann Sum using right hand rectangles.

(iii) Compute the limit of the Riemann Sum either by using integration or by computation.

(c) Given the function $f(x) = 1 + e^x$:

(i) Approximate the area between the curve and the *x*-axis on the interval $[2,6]$ using $n = 4$ right hand rectangles

(ii) Write a formula for the Riemann Sum using right hand rectangles.

(iii) Compute the limit of the Riemann Sum either by using integration or by computation.

(d) Given the function $f(x) = x^2 + x + 1$:

(i) Approximate the area between the curve and the *x*-axis on the interval $[0,6]$ using $n = 3$ left hand rectangles

(ii) Write a formula for the Riemann Sum using right hand rectangles.

(iii) Compute the limit of the Riemann Sum either by using integration or by computation.