Honors Math 182 Exam 1 Version B

1. Solve the following indefinite integrals:

(i) $\displaystyle\int \frac{1}{4+x^2}\,dx$

(ii) $\displaystyle\int (x^2+x+1)e^x\,dx$

(iii) $\displaystyle\int x\sqrt{x+8}\,dx$

2. Solve the following definite integrals:

(i) $\displaystyle\int_1^e \ln(5x)\,dx$

(ii) $\displaystyle\int_0^{\pi/6} \sin^2(x)\,dx$

(iii) $\displaystyle\int_0^1 \frac{1}{1+e^x}\,dx$

3. Find the following derivatives:

(i) $\dfrac{d}{dx}\left(\dfrac{1}{|x|+3}\right)$

(ii) $\dfrac{d}{dx}\ln\sqrt{\dfrac{9+x^2}{9-x^2}}$

(iii) $\dfrac{d}{dx}\arctan(7^x)$

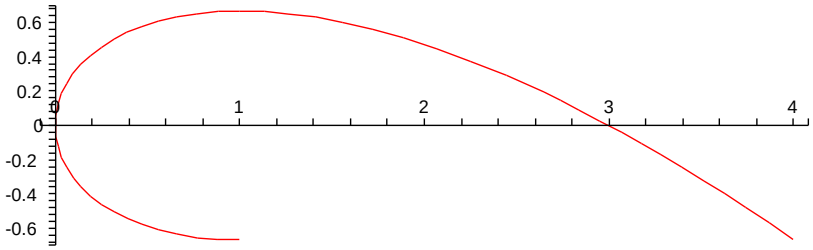
4. State and prove the integration by parts formula for definite integrals.

5. Make the substitution $u = \ln x$ in the following integrals, but DO NOT SOLVE THEM!

(i) $\displaystyle\int_1^e x\,dx$

(ii) $\displaystyle\int_2^4 \frac{1}{\ln x}\,dx$

6. Find the length of the curve



given by $\big(f(t), g(t)\big)$ where t ranges over $[-1, 2]$ and $f(t) = t^2$ and $g(t) = t - \frac{1}{3}t^3$.

7. A woman in a rowboat at point P is 5 miles from the nearest point A on a straight shore. She wishes to reach a point B that is 6 miles from A along the shore in the shortest time. Where should she land if she can row 2 miles/hour and walk 4 miles/hour?