Honors Math 182 Exam 1 Version A

1. Solve the following indefinite integrals:

(i) $\int (x^3 + 3^x)\, dx$

(ii) $\int \frac{1}{\sqrt{4 - x^2}}\, dx$

(iii) $\int \arctan \sqrt{x}\, dx$

(iv) $\int x^3 e^{2x^2}\, dx$

2. Solve the following definite integrals:

(i) $\displaystyle\int_0^1 \frac{x}{e^{x^2}}\,dx$

(ii) $\displaystyle\int_{-4}^1 x\sqrt{x+8}\,dx$

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

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

3. Find the following derivatives:

(i) $\dfrac{d}{dx}\ln(1+\cos^2 x)$

(ii) $\dfrac{d}{dx}\ln\sqrt{\dfrac{4+x^2}{4-x^2}}$

(iii) $\dfrac{d}{dx}|\arctan x|^3$

(iv) $\dfrac{d}{dx}\dfrac{\sin 2x}{x}$

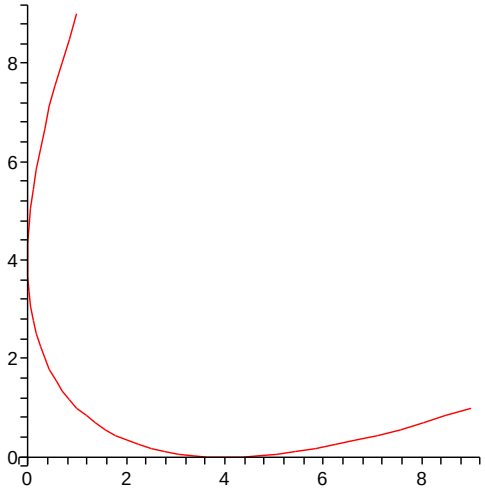
4. State and prove the integration by parts formula for definite integrals.

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

(i) $\displaystyle\int_0^4 x\,dx$

(ii) $\displaystyle\int_0^2 x \arctan\sqrt{x}\,dx$

6. Find the length of the curve



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

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