Tuesday April 9, 2002

1) **(18 points)** Evaluate the following integrals.

a) $\int \sin\frac{x}{2}\cos^3\frac{x}{2}\,dx$

b) $\int_0^2 \sqrt{4-x^2}\,dx$

c) $\int \frac{\left(1-\sqrt{x}\right)^4}{\sqrt{x}}\,dx$

2) **(10 points)** Find the mean value of the function $f(x)=|x^2-1|$ over the interval $[0,2]$.

3) **(10 points)** If $\int_0^x f(t)\,dt = \sin x + \tan x$. Find $f\left(\frac{\pi}{4}\right)$.

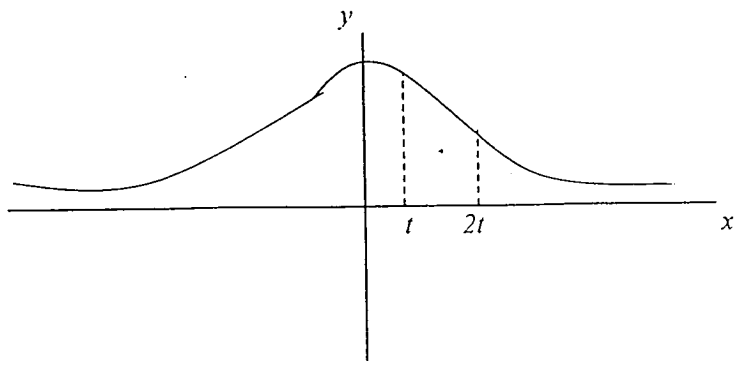
4) **(16 points)** Find the area of the region between the graph of $f(x)=x^2-4$ and the x-axis from $x=0$ to $x=3$.

5) **(26 points)** Find the volume of the solid generated by revolving the region enclosed by the curve $y=\sqrt{2x}$, the line $x=8$ and the line $y=2$, around

a) The line $y=2$.

b) The y-axis.

6) **(20 points)** Below is the graph of the function $f(x)=\frac{1}{x^2+1}$.



a) If t is a real positive variable and $y(t)$ is defined as $y(t)=\int_t^{2t} f(x)dx$, find $\frac{dy}{dt}$.

b) $y(t)$ (Defined in part (a)) represents the area of the region between the graph of $f(x)$ and x-axis from t to $2t$. Find t that maximizes this area.