Question 1:

(a)[6] Evaluate $\int_0^1 \arctan x \, dx$

(b)[4] Determine $\int \sin^3 x \cos^7 x \, dx$

Question 2 [10]:

Determine $\int \frac{1}{x\sqrt{9-x^2}}\,dx$. (State your final answer without using inverse hyperbolic functions.)

Question 3 [10]:

Determine $\displaystyle\int \frac{3x^2+8}{x^3+4x}\,dx$.

Question 4:

(a)[5 points] Use S_4, Simpson's rule on four subintervals, to approximate $\int_0^4 \sqrt{1+\sin^2(\pi x)}\,dx$.

(b)[5 points] The fourth derivative of $f(x) = \sqrt{1+\sin^2(\pi x)}$ is between -700 and 200 for every x. If we wish to approximate $\int_0^4 \sqrt{1+\sin^2(\pi x)}\,dx$ with accuracy 0.001 using Simpson's rule, how many subintervals are required?

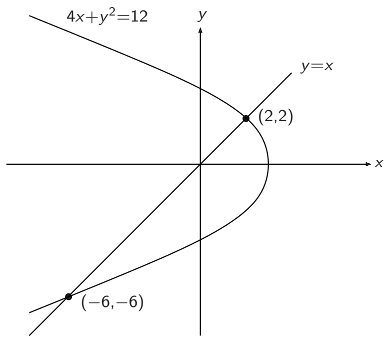
Question 5:

(a)[5 points] Evaluate the improper integral $\int_2^3 \frac{1}{\sqrt{3-x}}\,dx$. Show all steps including any required limits.

(b)[5 points] Determine if $\int_1^\infty \frac{\sin^2 x}{x^2+\sqrt{x}}\,dx$ converges or diverges. State reasons for your conclusion.

Question 6:

(a)[5 points] Find the area of the region bounded by the curves $4x + y^2 = 12$ and $y = x$.



(b)[5 points] The base of a solid is the region bounded between the curve $y = \sqrt{1 - x^2}$ and the x axis. Cross-sections perpendicular to both the base and the x-axis are squares. Find the volume of the solid.