Question 1:

(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 -7 and 3 for every x. If we wish to approximate $\int_0^4 \sqrt{1+\sin^2(2\pi)}\,dx$ with accuracy 0.001 using Simpson's rule, how large must n be? Recall, the error in Simpson's rule is at most $\frac{K(b-a)^5}{180n^4}$, where $|f^{(4)}(x)| \leq K$ on $[a,b]$.

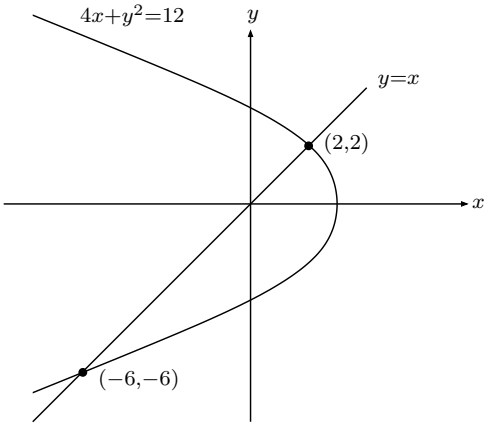
Question 2:

(a)[5 points] Evaluate the improper integral $\int_2^3 \frac{1}{\sqrt{3-x}}\,dx$.

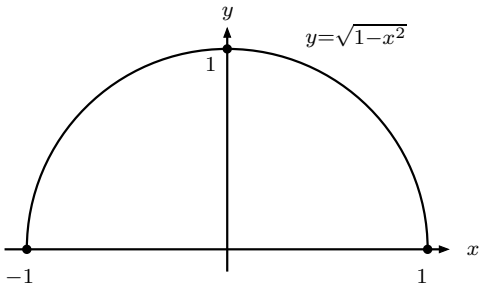
(b)[5 points] Determine if $\int_1^\infty \frac{\sin^2 x}{x^2+\sqrt{x}}\,dx$ converges or diverges. (Do not attempt to evaluate the integral).

Question 3:

(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.



Question 4 [10 points]: The region bounded by the curve $y = 2x - x^2$ and the x axis is rotated about the x-axis. Find the volume of the resulting solid.

Question 5 [10 points]: The region bounded by the curves $y = e^{(x+1)^2}$, $y = 0$, $x = 0$ and $x = 1$ is rotated about the vertical line $x = -1$. Find the volume of the resulting solid.