MATH 230 NAME:
8.2

Directions: Show all work on a separate sheet of paper for full credit.

1. Find the exact area of the surface obtained by rotating the curve about the x-axis.

   (a) $y = \cos\left(\frac{1}{2}x\right)$ for $0 \le x \le \pi$

   $$\int_0^{\pi} 2\pi \cos\left(\frac{1}{2}x\right)\sqrt{1+\frac{1}{4}\sin^2(x/2)}\,dx$$

   Let $u = \sin(x/2)$

   (b) $x = 1 + 2y^2$ for $1 \le y \le 2$

   $$\int_1^2 2\pi y\sqrt{1+16y^2}\,dy = \frac{\pi}{24}(65^{3/2} - 17^{3/2})$$

2. Find the exact area of the surface obtained by rotating $y = \frac{1}{3}x^{3/2}$, $0 \le x \le 12$ about the y-axis.

   $$\int_0^{12} 2\pi x\sqrt{1+x/4}\,dx$$

   Use $u = 1 + x/4$ to get

   $$\int_1^4 32\pi(u-1)\sqrt{u}\,du$$

   $$\int_1^4 32\pi(u^{3/2} - u^{1/2})\,du$$

   $$= \frac{3712\pi}{15}$$