Math 111 Quiz 12/1/17

Name Solutions

Evaluate the following integrals.

① $$\int_1^4 \frac{x^3 - 2\sqrt{x}}{x}\,dx = \int_1^4 \left(x^2 - 2x^{-1/2}\right)dx$$

$$= \left[\tfrac{1}{3}x^3 - 4x^{1/2}\right]_1^4$$

$$= \left(\tfrac{1}{3}\cdot 64 - 4\cdot 2\right) - \left(\tfrac{1}{3}\cdot 1 - 4\cdot 1\right)$$

$$= \tfrac{64}{3} - 8 - \tfrac{1}{3} + 4$$

$$= \underline{17}.$$

② $$\int_0^{\pi} \cos(x/6)\,dx$$ $\quad u = x/6$, $du = \frac{1}{6}dx$ ie $6du = dx$

$$= \int_{0/6}^{\pi/6} \cos(u)\cdot 6\,du$$

$$= 6\cdot\left[\sin u\right]_0^{\pi/6}$$

$$= 6\cdot\left(\tfrac{1}{2} - 0\right)$$

$$= \underline{3}.$$

③ $$\int_0^4 x\sqrt{x^2+9}\,dx$$ $\quad u = x^2+9$, $du = 2x\,dx$ ie. $x\,dx = \frac{1}{2}du$

$$= \int_{x=0}^{x=4} \sqrt{u}\cdot\tfrac{1}{2}du = \int_9^{25} \tfrac{\sqrt{u}}{2}\,du$$

$$= \tfrac{1}{2}\cdot\tfrac{2}{3}\cdot\left[u^{3/2}\right]_9^{25} = \tfrac{1}{3}\cdot\left(25\sqrt{25} - 9\sqrt{9}\right)$$

$$= \tfrac{1}{3}(125 - 27) = \underline{98/3}.$$