

Math 165 (Chris Kurth)
Spring 2008
Quiz 8

Show all work. Answers without work will not receive credit.

1. (6 points) Evaluate:

$$\int (4x^2 - \frac{1}{x^3}) dx$$

Solution: $\int (4x^2 - \frac{1}{x^3}) dx = \frac{4}{3}x^3 + \frac{1}{2}x^{-2} + C.$

2. (7 points) Evaluate:

$$\int t\sqrt{t^2 + 3} dt$$

Solution: Let $f(t) = t^2 + 3$. Then $\int t\sqrt{t^2 + 3} dt = \frac{1}{2} \int f'(t)f(t)^{1/2} dt = \frac{1}{2} \frac{2}{3} f(t)^{3/2} + C = \frac{1}{3} (t^2 + 3)^{3/2} + C$

3. (7 points) Find the curve satisfying

$$\frac{dy}{dx} = \sqrt{\frac{x}{y}}$$

passing through the point $(x, y) = (1, 4)$.

Solution: We have $\sqrt{y} dy = \sqrt{x} dx$. Integrate both sides to get: $\frac{2}{3}y^{3/2} = \frac{2}{3}x^{3/2} + C$. This is the family of curves satisfying the differential equation. Plug in $(x, y) = (1, 4)$ to get $\frac{16}{3} = \frac{2}{3} + C$, i.e. $C = \frac{14}{3}$. So the desired curve is $\frac{2}{3}y^{3/2} = \frac{2}{3}x^{3/2} + \frac{14}{3}$