

Math 2300 Calculus 2, Fall 2017  
Quiz 1

1. Find the following integrals:

(a)

$$\int \frac{x+2}{\sqrt{x^2+4x}} dx = \int \frac{\cancel{x+2}}{\sqrt{u}} \frac{du}{2(\cancel{x+2})}$$

$$u = x^2 + 4x$$

$$\frac{du}{dx} = 2x + 4 = 2(x+2)$$

$$\frac{du}{2(x+2)} = dx$$

$$= \frac{1}{2} \int \frac{1}{\sqrt{u}} du = \frac{1}{2} \frac{u^{1/2}}{\frac{1}{2}} + C$$

$$= \boxed{(x^2 + 4x)^{1/2} + C}$$

(b)

$$\int x\sqrt{x+3} dx = \int (u-3)\sqrt{u} du$$

$$u = x+3 \quad (x = u-3)$$

$$\frac{du}{dx} = 1$$

$$du = dx$$

$$= \int u\sqrt{u} - 3\sqrt{u} du$$

$$= \int u^{3/2} - 3u^{1/2} du$$

$$= \frac{2}{5} u^{5/2} - 3\left(\frac{2}{3}\right) u^{3/2} + C$$

$$= \boxed{\frac{2}{5} (x+3)^{5/2} - 2(x+3)^{3/2} + C}$$

(c)

$$\int \frac{\sqrt{\ln(x)}}{x} dx = \int \frac{\sqrt{u} du}{x}$$

$$u = \ln x$$

$$\frac{du}{dx} = \frac{1}{x}$$

$$x du = dx$$

$$= \int \sqrt{u} du = \frac{2}{3} u^{3/2} + C$$

$$= \frac{2}{3} (\ln x)^{3/2} + C$$

2. If  $\int_0^4 f(x) dx = 10$ , find  $\int_0^2 f(2x) dx$ .

$$u = 2x$$

$$\text{when } x = 0, u = 2(0) = 0$$

$$\frac{du}{dx} = 2$$

$$x = 2, u = 2(2) = 4$$

$$\int_0^2 f(2x) dx = \int_0^4 f(u) \frac{du}{2} = \frac{1}{2} \int_0^4 f(u) du$$

$$= \frac{1}{2} (10) = 5$$