

There are lots of correct ways to do these, these are just examples! Name: → Solution

Math 107H, Section 4

Quiz number 1

Show all work. How you get your answer is just as important, if not more important, than the answer itself.

Find the following integrals.

1. $\int \frac{x^2}{x+1} dx$ $u = x+1$ $du = dx$ $x = u-1$

$$= \int \frac{(u-1)^2}{u} du \Big|_{u=x+1} = \int \frac{u^2 - 2u + 1}{u} du \Big|_{u=x+1}$$

$$= \int u - 2 + \frac{1}{u} du \Big|_{u=x+1} = \frac{u^2}{2} - 2u + \ln|u| + C \Big|_{u=x+1}$$

$$= \boxed{\frac{(x+1)^2}{2} - 2(x+1) + \ln|x+1| + C}$$

2. $\int_0^{\pi/6} \sqrt{1 + \sin x} dx$

[Hint: note that $\sqrt{1 + \sin x} = \frac{\cos x}{\sqrt{1 - \sin x}}$.]

$$= \int_0^{\pi/6} \frac{\cos x}{\sqrt{1 - \sin x}} dx$$

$$u = 1 - \sin x$$

$$du = -\cos x dx$$

$$\cos x dx = -du$$

$$x=0 \rightarrow u = 1 - \sin 0 = 1 - 0 = 1$$

$$x = \pi/6 \rightarrow u = 1 - \sin \pi/6 = 1 - \frac{1}{2} = \frac{1}{2}$$

$$= - \int_1^{1/2} \frac{du}{\sqrt{u}} = - \int_1^{1/2} u^{-1/2} du = - \frac{u^{1/2}}{1/2} \Big|_1^{1/2}$$

$$= \boxed{\left(-\frac{(1/2)^{1/2}}{1/2}\right) - \left(-\frac{1}{1/2}\right)} = -\frac{2}{\sqrt{2}} + 2 = 2 - \sqrt{2}$$