# (7.2) Trigonometric Integrals

Full Name: ______________________________

1. Evaluate each of the following indefinite integrals.

   (a) Since we have an odd power of $\cos(\cdots)$, we can use $\cos^2\theta + \sin^2\theta = 1$ to reduce the power of $\cos(\cdots)$ until it is simply a single power of cosine. As such, we can let $u$ equal to $\sin(\cdots)$ and let substitution simplify our function's expression to the point where finding $F(x)$ can be a direct application of our integration facts.

   (b) We can resolve the oddity of the angle being $3\theta$ (instead of just $\theta$) by simply letting this be $x$ equal $3\theta$, computing $dx$, and substituting accordingly. At this point, the problem is similar to (1), but with an odd power of $\sin(\cdots)$.

   (c) Since we have an even power of $\sec(\cdots)$, we can use $1+\tan^2\theta = \sec^2\theta$ to reduce the power of $\sec(\cdots)$ until it is of degree two. At that point, letting $u$ equal $\tan(\cdots)$ will accommodate substitution in such a way that our original function will simplify into a form that will directly apply to our integration facts.

   (d) Similar to (c), although please note that we will have to multiply $1+u^2$ by itself twice. Please recall the fact that $(1+u^2) = (1+u^2)(1+u^2)$, which will demand distributing the terms of the first polynomial about the terms of the second.

   (e) Similar to (b) to resolve the angle of $3x$ (just let $\theta$ equal $3x$, compute $d\theta$, and substitute). From there, the exercise is similar to (c).

   (f) Since we have an odd power of $\tan(\cdots)$, we can use $1+\tan^2\theta = \sec^2\theta$ to reduce the power of $\tan(\cdots)$ until there is only one factor remaining. At that point, letting $u$ equal $\sec(\cdots)$ will accommodate substitution in such a way that our original function will simplify into a form that will directly apply to our integration facts.

   (g) Similar to (b) to resolve the $2x$. From there, the exercise is similar to (f), albeit with $1+\tan^2\theta = \sec^2\theta$ needing to be utilized twice. As such, please recall that $(u^2-1)^2$ is equal to $(u^2-1)(u^2-1)$, which demands distributing.

   (h) With only even powers of both $\sin(\cdots)$ and $\cos(\cdots)$, we must utilize the half-angle formulas: $\sin^2\theta = \dfrac{1}{2}\big(1-\cos^2(2\theta)\big)$; and $\cos^2\theta = \dfrac{1}{2}\big(1+\cos^2(2\theta)\big)$. These formulas can be repeatedly applied to reduce the degree of each $\sin(\cdots)$ and $\cos(\cdots)$ factor until they are of degree one. Be certain to remember to double the angle when applying these formulas!

   (i) Similar to (h).

   (j) Similar to (h).