Examples 6.2 – Derivatives and Antiderivatives of Cosine and Sine

1. Compute the following derivatives.

   Solution: (a) $\frac{d}{dx}\left(\sin\left(e^{5x}\right)\right) =$

   (b) $\frac{d}{dt}\left(-5.21\cos(3t - 1.33)\right) =$

   (c) $\frac{d}{dx}\left(\sin x \cos x\right) =$

2. Evaluate $\lim\limits_{x \to 0} \dfrac{\cos x + 3x - 1}{\sin x}$.

   Solution:

3. Assuming that the FTC holds for sine and cosine, evaluate $\int_0^{\pi} (5\sin x + 2\cos x)\, dx$.

   Solution:

4. In Lesson 5.2, we learned via u-substitution that $\int e^{kx}dx = \frac{1}{k}e^{kx} + C$. That is, when the "inside" of an exponential is a constant multiple of x, then we "pick up" a factor of $1/k$ when integrating. The same is true for $y = \sin kx$ and $y = \cos kx$. Use this fact to evaluate the following.

   Solution: (a) $\int \sin 10x\, dx =$

   (b) $\int 3\cos 2x\, dx =$