MATH 1060: Unit 4 Review

Useful Trig Derivatives

- $\frac{d}{dx}(\sin(x)) = \cos(x)$
- $\frac{d}{dx}(\cos(x)) = -\sin(x)$
- $\frac{d}{dx}(\tan(x)) = \sec^2(x)$
- $\frac{d}{dx}(\cot(x)) = -\csc^2(x)$
- $\frac{d}{dx}(\sec(x)) = \sec(x)\tan(x)$
- $\frac{d}{dx}(\csc(x)) = -\csc(x)\cot(x)$

Useful Inverse Trig Derivatives

- $\frac{d}{dx}\left[\sin^{-1} x\right] = \frac{1}{\sqrt{1-x^2}}$
- $\frac{d}{dx}\left[\cos^{-1} x\right] = \frac{-1}{\sqrt{1-x^2}}$
- $\frac{d}{dx}\left[\tan^{-1} x\right] = \frac{1}{1+x^2}$
- $\frac{d}{dx}\left[\csc^{-1} x\right] = \frac{-1}{|x|\sqrt{x^2-1}}$
- $\frac{d}{dx}\left[\sec^{-1} x\right] = \frac{1}{|x|\sqrt{x^2-1}}$
- $\frac{d}{dx}\left[\cot^{-1} x\right] = \frac{-1}{1+x^2}$

Note: Do not forget CHAIN RULE!! You must multiply by the derivative of the inside!
i.e.

$$\frac{d}{dx}\left[\sin^{-1}(g(x))\right] = \frac{1}{\sqrt{1-g(x)^2}} \cdot g'(x)$$

5.4: Working with Integrals

Theorem: Let a be a positive real number and let f be an integrable function on $[-a, a]$.

- If f is even, $\displaystyle\int_{-a}^{a} f(x)dx = 2\int_{0}^{2} f(x)dx$
- If f is odd, $\displaystyle\int_{-a}^{a} f(x)dx = 0$

even function: symmetric about y-axis; $f(-x) = f(x)$
odd function: symmetric about origin; $f(-x) = -f(x)$

Average Value: $\bar{f} = \frac{1}{b-a}\displaystyle\int_a^b f(x)dx$

MVT for integrals: Let f be continous on $[a, b]$. There exists a point c in (a, b) such that

$$f(c) = \bar{f} = \frac{1}{b-a}\int_a^b f(x)dx$$

5.5: U-Substitution

Indefinite Integrals:

1. Identify u such that a constant multiple of du (derivative of u) appears in the integrand.
2. Substitute u and $du = u'dx$ into the integral.
3. Evaluate the new indefinite integral with respect to u. Don't forget your $+C$.
4. Replace u with the function of x, so your final answer is in terms of x.

Definite Integrals:

1. Identify u such that a constant multiple of du appears in the integrand.
2. Change your bounds of integration by plugging in your original a and b into your function of u.
3. Substitute u and $du = u'dx$ and the new bounds, $u(a)$ and $u(b)$, into the integral.
3. Evaluate the new definite integral like normal. You do NOT have to make any substitutions to get in terms of x in the definite integral case since you have changed your bounds.