MATH 152

Today

1. Questions/WeBWorK
2. 6.1 Integration by Parts

Goals:

1. 6.1 Integration by Parts (Understand how to perform integration by parts as a technique for reversing the Product Rule)

Where is today's material used?

1. Physics: distance traveled by a particle (among many others)
2. Chemistry: fraction of gas molecules that can participate in a reaction (among many others)
3. Economics: finding total cost given marginal cost (among many others)
4. Any discipline that includes a notion of accumulated change.

6.1 Integration by Parts

1. **Theorem (The Product Rule):** If f and g are differentiable functions and $F = fg$ is their product, then F is differentiable and
$$F'(x) = f'(x)g(x) + g'(x)f(x).$$
2. **Theorem (Integration by Parts):** $\int f(x)g'(x)dx = f(x)g(x) - \int g(x)f'(x)dx$. Putting $u = f(x)$ and $v = g(x)$, this can be expressed as
$$\int udv = uv - \int vdu.$$
3. **Strategy**:

(a) Choose u to be a factor of the integrand whose derivative is "simpler."

(b) Then dv is the rest of the integrand, and it needs to be something you can integrate. If it isn't, go back to step 1 and try again.

(c) $\int vdu$ should be easier to integrate than $\int udv$. If it isn't, go back to step 1 and try again. If it is, treat $\int vdu$ as a new problem and go from there.

(d) **NOTE:** This technique does not always work. Also, be aware that the u and du in this technique are not the same as those in u-substitution.

4. Examples: 6.1, p. 316: 12, 16, 20

Next Time

1. Catch up/review for Exam

2. Turn in WeBWorK 6.1, Set08-IntbyParts: 2, 4