

Name: _____

Notesheet. Section 6.2: Integration by Substitution

Math 1210

Challenge 1. We have learned how to solve basic integrals. What about more complicated ones? Can you solve this more complicated integral?

$$\int 2x\sqrt{1+x^2} dx$$

Remember, you need only find a function $F(x)$ such that $F'(x) = 2x\sqrt{1+x^2}$. (Hint: think about the chain rule for derivatives.)

Theorem 2. Let F and g be differentiable functions. If F' is continuous on the range of g , then

$$\int F'(g(x))g'(x) dx =$$

Challenge 3. Compute the following indefinite integrals using substitution.

(a) $\int \sqrt{2x+1} dx$ (Hint: substitute $u = 2x+1$)

(b) $\int \frac{x}{\sqrt{1-4x^2}} dx$

(c) $\int e^{5x} dx$

Challenge 4. The registrar of a university estimates that total student enrollment in the Continuing Education division will grow at the rate of

$$N'(t) = 2000(1 + 0.2t)^{-\frac{3}{2}} \text{ students/year}$$

t years from now. If the current student enrollment is 1000, find an expression giving the total student enrollment t years from now. What will student enrollment be 5 years from now?

Challenge 5. Find $\int \frac{(\ln x)^2}{x} dx$