Name:_______________________________________ Band:_________

Calculus | Packer Collegiate Institute | 2008-2009

Antiderivatives: LET YOUR BRAINS TRY THEM OUT!

You've done some matching of anti-derivatives with the function. Now see if you can work backwards and come up with the anti-derivatives for the following functions.

Once you come up with a potential anti-derivative, check to see if it is truly an antiderivative.

Example: Find the antiderivative of $\sin(x)$.

My thought process:

Brain 1: "What function, when I take the derivative of it, gives me $\sin(x)$?"

Brain 2: "Obviously it is $\cos(x)$. Sine and cosine are derivatives of each other. Duh."

Brain 1: "Hm. It sounds plausible. Let's check to see if it works. So $\frac{d}{dx}\cos(x) = -\sin(x)$. Brain 2, you are WRONG. We aren't getting $\sin(x)$."

Brain 2: "Well, since we are off by a negative sign, what about $-\cos(x)$ being the antiderivative, instead of $\cos(x)$."

Brain 1: "Okay, let's try it out. So $\frac{d}{dx} - \cos(x) = \sin(x)$. Hooray!"

Brain 2: "I am so smart, SMRT."

Example: Find the antiderivative of x^2.

My thought process:

Brain 1: "What function, when I take the derivative of it, gives me x^2?"

Brain 2: "Well, what about $2x$?"

Brain 1: "Hm. It sounds plausible. Let's check to see if it works. So $\frac{d}{dx}2x = 2$. Brain 2, you are WRONG. We aren't getting x^2. You gave me the *derivative* of x^2 … not the *antiderivative*."

Brain 2: "Wait. I think I'm getting it. When we take derivatives of things like x^{28}, we get a lower degree… In this case, we'd get $28x^{27}$. So for if we want to get the antiderivative of x^2, wouldn't we want to try x^3? Derivatives give us one lower degree, so wouldn't we want one higher degree for antiderivatives?"

Brain 1: "Mayhaps! So $\frac{d}{dx}x^3 = 3x^2$. DRAT! SO CLOSE. We are getting $3x^2$. We need to get x^2."

Brain 2: "We well want to get rid of the constant 3, so why don't we try the function $\frac{1}{3}x^3$? That way the 3 and $\frac{1}{3}$ cancel each other out."

Brain 1: "Okay, lemme check. $\frac{d}{dx}\frac{1}{3}x^3 = \frac{1}{3}(3x^2) = x^2$. You did it! You're the best."

Brain 2: "I know."

1. Find the antiderivative of 3.

Check to make sure that you are right: $\frac{d}{dx}[\qquad\qquad] = 3$

2. Find the antiderivative of -17.

Check to make sure that you are right: $\frac{d}{dx}[\qquad\qquad] = -17$

3. Find the antiderivative of x.

Check to make sure that you are right: $\frac{d}{dx}[\qquad\qquad] = x$

4. Find the antiderivative of x^2.

Check to make sure that you are right: $\frac{d}{dx}[\qquad\qquad] = x^2$

5. Find the antiderivative of x^3.

Check to make sure that you are right: $\frac{d}{dx}[\qquad\qquad] = x^3$

6. Find the antiderivative of x^4.

Check to make sure that you are right: $\frac{d}{dx}[\qquad\qquad] = x^4$

7. Find the antiderivative of x^{21}.

Check to make sure that you are right: $\frac{d}{dx}[\qquad\qquad] = x^{21}$

8. Find the antiderivative of $x^{1/2}$.

Check to make sure that you are right: $\frac{d}{dx}[\qquad\qquad] = x^{1/2}$

9. Find the antiderivative of $x^{-4/5}$.

Check to make sure that you are right: $\frac{d}{dx}[\qquad\qquad] = x^{-4/5}$

10. Find the antiderivative of $\sin(2x)$.

Check to make sure that you are right: $\frac{d}{dx}[\qquad\qquad] = \sin(2x)$

11. Find the antiderivative of $\sin(3x)$.

Check to make sure that you are right: $\frac{d}{dx}[\qquad\qquad] = \sin(3x)$

12. Find the antiderivative of $\sin(\sqrt{2}x)$.

Check to make sure that you are right: $\frac{d}{dx}[\qquad\qquad] = \sin(\sqrt{2}x)$

13. Find the antiderivative of $\cos(\pi x)$.

Check to make sure that you are right: $\frac{d}{dx}[\qquad\qquad] = \cos(\pi x)$

14. Find the antiderivative of $3x^4 + x^2$.

Check to make sure that you are right: $\frac{d}{dx}[\qquad\qquad] = 3x^4 + x^2$

15. Find the antiderivative of $2x + 5\sin(x)$.

Check to make sure that you are right: $\frac{d}{dx}[\qquad\qquad] = 2x + 5\sin(x)$

16. Find the antiderivative of $-5\sec^2(x)$.

Check to make sure that you are right: $\frac{d}{dx}[\qquad\qquad] = -5\sec^2(x)$

17. Find the antiderivative of $\cos^2(x)\sin(x)$.

Check to make sure that you are right: $\frac{d}{dx}[\qquad\qquad] = \cos^2(x)\sin(x)$

18. Find the antiderivative of $5x\sin(x^2)$.

Check to make sure that you are right: $\frac{d}{dx}[\qquad\qquad] = 5x\sin(x^2)$