Anti-Derivatives

Derivatives and Anti-Derivatives (add $+C$ for general form)

$f'(x)$	$\Leftarrow$	$f(x)$	$\Rightarrow$	$F(x)$	$f'(x)$	$\Leftarrow$	$f(x)$	$\Rightarrow$	$F(x)$
0	$\Leftarrow$	1	$\Rightarrow$	x	$a\cos(ax)$	$\Leftarrow$	$\sin(ax)$	$\Rightarrow$	$-{}^1\!/_a\cos(ax)$
1	$\Leftarrow$	x	$\Rightarrow$	${}^1\!/_2\,x^2$	$-a\sin(ax)$	$\Leftarrow$	$\cos(ax)$	$\Rightarrow$	${}^1\!/_a\sin(ax)$
$2x$	$\Leftarrow$	x^2	$\Rightarrow$	${}^1\!/_3\,x^3$	$a\,e^{ax}$	$\Leftarrow$	e^{ax}	$\Rightarrow$	${}^1\!/_a\,e^{ax}$
$n\,x^{n-1}$	$\Leftarrow$	x^n	$\Rightarrow$	$\frac{1}{n+1}\,x^{n+1}$	$2^x\ln(2)$	$\Leftarrow$	2^x	$\Rightarrow$	$2^x/\ln(2)$
Multiply by power		New power is $(n+1)$			${}^1\!/_x$	$\Leftarrow$	$\ln(x)$	$\Rightarrow$	???
New power is $(n-1)$		**Divide** by power							

1. **(Deriv. and Anti-Deriv.)** Write <u>derivative $f'(x)$</u> and <u>anti-derivative $F(x)$</u> for the functions below.

A. $F(x) =$ [   ]

$f(x) \;=\; x^2 \,+\, x \,+\, 1$

$f'(x) =$ [   ]

B. $F(x) =$ [   ]

$f(x) \;=\; 7x^4 \,+\, 5x^2 \,+\, 3$

$f'(x) =$ [   ]

C. $F(x) =$ [   ]

$f(x) \;=\; x^{5/2} \,+\, x^{1/2} \,+\, x^{-3/2}$

$f'(x) =$ [   ]

D. $F(x) =$ [   ]

$f(x) \;=\; 4x^3 \,+\, 3x^2 \,+\, 2x \,+\, 1$

$f'(x) =$ [   ]

E. $F(x) =$ [   ]

$f(x) \;=\; x^{1/2} \,+\, x^{2/3} \,+\, x^{3/4}$

$f'(x) =$ [   ]

F. $F(x) =$ [   ]

$f(x) \;=\; e^{2x} \,+\, \sin(3x) \,+\, \cos(5x)$

$f'(x) =$ [   ]

2. (Initial Value Problems) Solve the initial value problems below.

A. Find $f(x)$ if $f'(x) = x + 1$ with $f(0) = 5$.

D. Find $f(x)$ if $f'(x) = 3x^2 + 1$ with $f(0) = 5$.

B. Find $f(x)$ if $f'(x) = x + 1$ with $f(1) = 5$.

E. Find $f(x)$ if $f'(x) = 3x^2 + 1$ with $f(1) = 5$.

C. Find $f(x)$ if $f'(x) = \cos(x)$ with $f(0) = 5$.

F. Find $f(x)$ if $f'(x) = \sin(x)$ with $f(0) = 5$.

3. Write a course review!!!

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for math 241!