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Test

Test: Calculus I - Differentiation Formulas - Quiz 1

Number of Questions: 10

Time: 29 : 59

If $f(x) = \left(\frac{1}{x} + \frac{1}{x^2}\right)(3x^3 + 27)$ then $f'(x)$ is

$y = 3x^2 + 3x + \frac{27}{x} + \frac{27}{x^2}$

$y' = 6x + 3 - \frac{27}{x^2} - \frac{54}{x^3}$

- ~~$3 + 6x - 27x^{-2} + 54x^{-3}$~~
- ~~$3 + 6x + 27x^{-2} - 54x^{-3}$~~
- ~~$3 - 6x - 27x^{-2} - 54x^{-3}$~~
- ~~$-3 + 6x - 27x^{-2} - 54x^{-3}$~~
- ✓ $3 + 6x - 27x^{-2} - 54x^{-3}$

If $y = (2x^7 - x^2)\left(\frac{x-1}{x+1}\right)$ then $y'(1)$ is

$x^2(2x^5 - \cancel{x}1)$

$\frac{2x^8 - 2x^7 - x^3 + x^2}{x+1}$

$\rightarrow \frac{(16x^7 - 14x^6 - 3x^2 + 2x) - 2x^8 + 2x^7 + x^3 - x^2}{(x+1)^2}$

$y'(1) = \frac{16 - 14 \cancel{- 3 + 2 - 2 + 2 + 1 - 1}}{4} = \frac{1}{4}$

- 1
- $\frac{1}{3}$
- ✓ $\frac{1}{4}$
- $\frac{1}{5}$
- $\frac{1}{2}$

If $f(x) = (x^2 + 1)\sec x$ then $f'(x)$ is

$\frac{x^2+1}{\cos x} \rightarrow \frac{2x\cos x - (x^2+1)(-\sin x)}{\cos^2 x}$

$= 2x\sec x + (x^2+1)\tan x \sec x$

- $-(x^2+1)\csc x \tan x + 2\sec x$
- $-(x^2+1)\csc x \tan x + 2x\sec x$
- $(x^2+1)\csc x \tan x + 2x\sec x$
- $-(x^2+1)\sec x \tan x + 2x\sec x$
- ✓ $(x^2+1)\sec x \tan x + 2x\sec x$

If $f(x) = \dfrac{1}{\cot x}$ then $f'(x)$ is

$= \tan x \quad d(\tan x) = \sec^2 x$

- $\cot^2 x$
- $\tan^2 x$
- $\cos^2 x$
- $\sin^2 x$
- ✓ $\sec^2 x$

If $y = \tan x$ then $\dfrac{d^2y}{dx^2}$ is

$y' = \sec^2 x$
$y'' = 2\sec x \cdot \sec x \tan x$
$= 2\sec^2 x \tan x$

- $2\tan^2 x \sec x$
- $2\cot^2 x \csc x$
- $2\sin^2 x \tan x$
- $2\cos^2 x \cot x$
- ✓ $2\sec^2 x \tan x$

If $f(x) = \sin^3 x$ then $f'(x)$ is

$3\sin^2 x \cdot \cos x$

- $-3\cos^2 x \sin x$
- $3\sin x \cos x$
- $-3\sin^2 x \cos x$
- $3\cos^2 x \sin x$
- ✓ $3\sin^2 x \cos x$

If $f(x) = \cos^3\left(\dfrac{x}{x+1}\right)$ then $f'(x)$ is $3\cos^2\left(\frac{x}{x+1}\right) \cdot \left(-\sin\frac{x}{x+1}\right) d\left(\frac{x}{x+1}\right)$

$\frac{x}{x+1} \to \frac{x+1-1(x)}{(x+1)^2} = \frac{1}{(x+1)^2}$

- ✓ $-\dfrac{3}{(x+1)^2}\cos^2\left(\dfrac{x}{x+1}\right)\sin\left(\dfrac{x}{x+1}\right)$ $= \frac{-3}{(x+1)^2}\cos^2\frac{x}{x+1}\left(\sin\frac{x}{x+1}\right)$
- $\dfrac{3}{(x+1)^2}\cos^2\left(\dfrac{x}{x+1}\right)\sin\left(\dfrac{x}{x+1}\right)$
- $-\dfrac{3}{(x+1)^2}\cos^2\left(\dfrac{x}{x+1}\right)$
- $-\dfrac{3}{(x+1)^2}\cos^2\left(\dfrac{x}{x+1}\right)\cos\left(\dfrac{x}{x+1}\right)$
- $\dfrac{3}{(x+1)^2}\cos^2\left(\dfrac{x}{x+1}\right)$

If $f(x) = \left[x^4 - \sec\left(4x^2 - 2\right)\right]^{-4}$ then $f'(x)$ is

$\cdot -4\left[x^4 - \sec(4x^2-2)\right]^{-5}$

$\left(4x^3 - 8x\sec(4x^2-2)\tan(4x^2-2)\right)$

$\left(x^3 - 2x\sec u\tan u\right)$

$4x\left(x^2 - 2\sec u\tan u\right)$

- [ ] $-16x\left[x^4 - \sec\left(4x^2-2\right)\right]^{-5}\left[x^2 - 2\cos\left(4x^2-2\right)\cot\left(4x^2-2\right)\right]$
- [ ] $-16x\left[x^4 - \sec\left(4x^2-2\right)\right]^{-5}\left[x^2 - 2\csc\left(4x^2-2\right)\cot\left(4x^2-2\right)\right]$
- [ ] $-16x\left[x^4 - \sec\left(4x^2-2\right)\right]^{-5}\left[x^2 - 2\csc\left(4x^2-2\right)\tan\left(4x^2-2\right)\right]$
- [x] $-16x\left[x^4 - \sec\left(4x^2-2\right)\right]^{-5}\left[x^2 - 2\sec\left(4x^2-2\right)\tan\left(4x^2-2\right)\right]$
- [ ] $-16x\left[x^4 - \sec\left(4x^2-2\right)\right]^{-5}\left[x^2 - 2\sec\left(4x^2-2\right)\cot\left(4x^2-2\right)\right]$

If $y = \dfrac{\sin x}{\sec(3x+1)}$ then y' is

$y = \sin x\cos(3x+1)$

$y' = \cos x\cos(3x+1) - \sin x\sin(3x+1)\cdot 3$

- [ ] None of the above
- [ ] ~~$-\cos x\cos(3x+1) + 3\sin x\sin(3x+1)$~~
- [ ] ~~$-\cos x\cos(3x+1) - 3\sin x\sin(3x+1)$~~
- [ ] $\cos x\cos(3x+1) + 3\sin x\sin(3x+1)$
- [x] $\cos x\cos(3x+1) - 3\sin x\sin(3x+1)$

If $y = \left(\dfrac{1+x^2}{1-x^2}\right)^{17}$ then y' is

$17\left(\dfrac{1+x^2}{1-x^2}\right)^{16}\cdot\dfrac{d}{dx}\left(\dfrac{1+x^2}{1-x^2}\right)$

$\dfrac{2x(1-x^2) - (1+x^2)(-2x)}{(1-x^2)^2}$

$= 2x - \cancel{2x^3} + 2x + \cancel{2x^3}$

$= 4x$

$= 68x\left(\dfrac{1+x^2}{1-x^2}\right)^{16}$

- [ ] $\dfrac{72x\left(1+x^2\right)^{16}}{\left(1-x^2\right)^{18}}$
- [ ] $\dfrac{52x\left(1+x^2\right)^{16}}{\left(1-x^2\right)^{18}}$
- [ ] $\dfrac{24x\left(1+x^2\right)^{16}}{\left(1-x^2\right)^{18}}$
- [ ] $\dfrac{70x\left(1+x^2\right)^{16}}{\left(1-x^2\right)^{18}}$
- [x] $\dfrac{68x\left(1+x^2\right)^{16}}{\left(1-x^2\right)^{18}}$

RESULT

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Test: Calculus I - Derivatives of Logarithmic and Exponential Functions - Quiz 1

Number of Questions: 12

Time: 24 : 58

If $y = \ln\left(\frac{(x^2+1)^5}{\sqrt{1-x}}\right)$, then y' is

$5\ln x^2+1 - \frac{1}{2}\ln(1-x)$

$\rightarrow \frac{5}{x^2+1}\cdot 2x + \frac{1}{2(1-x)} = \frac{10x}{x^2+1} + \frac{1}{2(1-x)}$

$dy = \frac{5 \cdot 10x(x^2+1)^4(\sqrt{1-x}) + (x^2+1)^5 \frac{1}{2\sqrt{1-x}}}{1-x}$

$\sqrt{1-x} \rightarrow \frac{-1}{2\sqrt{1-x}}$

- [ ] $\frac{5x}{x^2+1} + \frac{1}{3(1-x)}$
- [ ] $\frac{5x}{x^2+1} + \frac{1}{2(x-1)}$
- [ ] $\frac{5x}{x^2+1} + \frac{1}{2(1-x)}$
- [x] $\frac{10x}{x^2+1} + \frac{1}{2(1-x)}$
- [ ] $\frac{10x}{x^2+1} + \frac{1}{2(x-1)}$

$\frac{\sqrt{1-x}}{(x^2+1)^5}\left(\frac{10x(x^2+1)^4}{1-x} + \frac{(x^2+1)^5}{2(1-x)^{1.5}}\right)$

$= \frac{10x}{(x^2+1)} + \frac{1}{2(1-x)}$

If $y = \ln(\ln x)$, then y' is

$\frac{1}{\ln x}\cdot\frac{1}{x} = \frac{1}{x\ln x}$

- [ ] $\frac{1}{x}$
- [ ] $\frac{1}{\ln x}$
- [ ] $\frac{x}{\ln x}$
- [ ] $\frac{4}{x\ln x}$
- [x] $\frac{1}{x\ln x}$

$x \ln x \to \ln x + 1$

If $y = \dfrac{x \ln x}{1 + \ln x}$, then y' is

$\dfrac{(\ln x+1)^2 - \ln x}{(1+\ln x)^2} = \cancel{\dfrac{\ln^2 x + 2\ln x + 1}{(1+\ln x)^2}}$

- $1 - \dfrac{\ln x}{(1 + \ln x)^2}$ ✓
- $\dfrac{x \ln x}{(1 + \ln x)^2}$
- $1 - \dfrac{x \ln x}{(1 + \ln x)^2}$
- $1 + \dfrac{x \ln x}{(1 + \ln x)^2}$
- $1 + \dfrac{\ln x}{(1 + \ln x)^2}$

$= 1 - \dfrac{\ln x}{(1+\ln x)^2}$

If $y = \dfrac{1 + \ln t}{t}$, then y' is

$\dfrac{1-(1+\ln t)}{t^2} = \dfrac{-\ln t}{t^2}$

- $-\dfrac{t + \ln t}{t^2}$
- $-\dfrac{\ln t}{t^2}$ ✓
- $-\dfrac{2 \ln t}{t^2}$
- $\dfrac{2 \ln t}{t^2}$
- $\dfrac{\ln t}{t^2}$

If $y = t\sqrt{\ln t}$, then y' is

$= \sqrt{\ln t} + \dfrac{\cancel{t}}{2\sqrt{\ln t}} \cdot \dfrac{1}{\cancel{t}}$

- $(\ln t)^2 - \dfrac{1}{2(\ln t)^{1/2}}$
- $(\ln t)^2 - \dfrac{1}{2(\ln t)^2}$
- $(\ln t)^2 + \dfrac{1}{2(\ln t)^{1/2}}$

- [x] $(\ln t)^{1/2} + \frac{1}{2(\ln t)^{1/2}}$
- [ ] $(\ln t)^{1/2} + \frac{1}{2(\ln t)^{2}}$

$10x^{-1} \to -10x^{-2}$

If $y = \ln \frac{10}{x}$, then y' is

$y' = \frac{1}{\frac{10}{x}} \cdot \frac{-10}{x^2} = \frac{-10}{x^2 \frac{10}{x}} = \frac{-1}{x}$

- [ ] $\ln x$
- [ ] $\frac{1}{10x}$
- [ ] $\frac{10}{x}$
- [x] $-\frac{1}{x}$
- [ ] $\frac{1}{x}$

If $f(x) = x^{1-x}$, then $f'(x)$ is

$\ln y = (1-x)\ln x$

$\frac{dy}{dx}\frac{1}{y} = \frac{1-x}{x} - \ln x$

$\frac{dy}{dx} = x^{1-x}\left(\frac{1-x}{x} - \ln x\right)$

$= x^{1-x}\left(\frac{1}{x} - 1 - \ln x\right)$

- [ ] $\cancel{x^{1-x}\left(-\ln x + 1 - \frac{1}{x}\right)}$
- [ ] $x^{1-x}\left(-\ln x - 1 - \frac{1}{x}\right)$
- [ ] $\cancel{x^{1-x}\left(-\ln x + 1 + \frac{1}{x}\right)}$
- [x] $x^{1-x}\left(-\ln x - 1 + \frac{1}{x}\right)$
- [ ] $\cancel{x^{1-x}\left(\ln x - 1 + \frac{1}{x}\right)}$

If $f(x) = e^{3x-1}$, then $f'(x)$ is $3e^{3x-1}$

- [ ] $-\frac{1}{3}e^{3x-1}$

- $(3x-1)e^{3x-2}$
- $\frac{1}{3}e^{3x-1}$
- e^{3x-1}
- ✓ $3e^{3x-1}$

If $f(x) = \frac{1-x}{e^x}$, then $f'(x)$ is

$\frac{-e^x - (1-x)e^x}{e^{2x}} = \frac{-2e^x + xe^x}{e^{2x}}$

$= \frac{-2+x}{e^x}$

- ✓ $\frac{x-2}{e^x}$
- $\frac{1-x}{e^x}$
- $\frac{x+1}{e^x}$
- $\frac{x-1}{e^x}$
- $\frac{x+2}{e^x}$

If $f(x) = e^{\sqrt{x}} + e^{-\sqrt{x}}$, then $f'(x)$ is

$-x^{0.5} \to \frac{-x^{-0.5}}{2}$

$\frac{e^{\sqrt{x}}}{2\sqrt{x}} - \frac{e^{-\sqrt{x}}}{2\sqrt{x}}$

- ✓ $\frac{e^{\sqrt{x}} - e^{-\sqrt{x}}}{2\sqrt{x}}$
- $\cancel{\frac{e^{\sqrt{x}} + e^{-\sqrt{x}}}{\sqrt{x}}}$
- $\cancel{\frac{e^{\sqrt{x}} - e^{-\sqrt{x}}}{\sqrt{x}}}$
- $-\frac{e^{\sqrt{x}} + e^{-\sqrt{x}}}{2\sqrt{x}}$
- $\frac{e^{\sqrt{x}} + e^{-\sqrt{x}}}{2\sqrt{x}}$

If $f(x) = \sin(2e^x)$, then $f'(x)$ is

$2e^x \cos 2e^x$

- $2e^x \cos(2e^x)$
- $2e^x \sin(2e^x - 1)$
- $-e^x \cos(2e^x)$
- $e^x \cos(2e^x)$
- $-2e^x \cos(2e^x)$

If $f(x) = x(3^{-5x})$, then $f'(x)$ is

$3^{-5x} + x(3^{-5x})\cdot(-5\ln 3)$
$= 3^{-5x}(1 - 5x\ln 3)$

$y = 3^{-5x}$
$\ln y = -5x\ln 3$
$\frac{dy}{dx}\frac{1}{y} = -5\ln 3$
$\frac{dy}{dx} = 3^{-5x}\cdot -5\ln 3$

- $3^{-5x}(1 - 5x\ln 3)$
- $3^{-5x}(x - 5\ln 3)$
- $x3^{-5x}(1 + 5x\ln 3)$
- $x3^{-5x}(1 - 5x\ln 3)$
- $3^{-5x}(1 + 5x\ln 3)$

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Test: Calculus I - Section 3.7 - Indeterminate Forms and L'Hospital's Rule - Average - Quiz 1

Number of Questions: 8

Time: 24 : 59

$$\lim_{\theta \to 0} \frac{\tan \theta}{\theta} = \frac{\sec^2\theta}{1} = \cos^2\theta = 1$$

L'hopital

$\cancel{\cos\theta}$

- ∞
- 0
- $\frac{1}{2}$
- 1 ✓
- 2

$$\lim_{x \to \infty^+} \frac{x^{100}}{e^x} = \frac{100x^{99}}{e^x} = \cdots = \frac{100!}{e^x}$$

L'hopital

- ∞
- 1
- e
- 0 ✓
- $\frac{1}{e}$

$$\lim_{x \to 0} \frac{\sin^{-1} 2x}{x} \quad \frac{2 \cdot \frac{1}{\sqrt{1-x^2}}}{1} \cancel{=} = \frac{1}{2}$$

- ∞
- 2
- 1

- 0
- $\frac{1}{2}$ ✓

$$\lim_{x\to\pi/2^-} \sec 3x \cos 5x$$

$\frac{\pi}{2} = 90^\circ$

$\frac{\cos 5x}{\cos 3x} = \frac{\cos 450}{\cos 270} = \frac{\cos 90}{\cos 270} = \frac{+0}{-0}$

$\frac{\cos 5x}{\cos 3x}$

$\frac{(5)-\sin 5x}{(3)-\sin 3x}$

$\frac{5\sin 90}{3\sin 270} = \frac{5}{-3} = -\frac{5}{3}$

- $-\frac{5}{3}$ ✓
- $-\infty$
- $-\frac{\sqrt{2}}{2}$
- $-\frac{1}{2}$
- 0

$$\lim_{x\to\infty} (1 + a/x)^{bx}$$

$\ln y = bx\ln(1+\frac{a}{x})$

$= \frac{\ln(1+\frac{a}{x})}{(bx)^{-1}}$

$x^{-1} \to -x^{-2}$

$(bx)^{-1} \to \frac{1}{b}(x^{-1}) \to \frac{-1}{bx^2}$

$\frac{a}{x} \to \frac{-a}{x^2}$

$= \frac{1}{1+\frac{a}{x}} \cdot \frac{-a}{x^2}$

$= \frac{a}{(1+\frac{a}{x})\cancel{x}} \cdot \frac{bx^{\cancel{2}}}{1} = \frac{ab}{1+\frac{a}{x}} = ab$

$\ln y = ab$

$e^{ab} = y$

$\ln y = bx\ln(1+\frac{a}{x})$

$\frac{dy}{dx}\frac{1}{y} = b\ln(1+\frac{a}{x}) + \frac{bx}{(1+\frac{a}{x})} \cdot \frac{-1}{x^2}$

- ∞
- e^{ab} ✓
- 0
- $e^{\frac{a}{b}}$
- $e^{-\frac{a}{b}}$

$$\lim_{x\to1} (2 - x)^{\tan(\pi/2)x}$$

$\ln y = \tan\frac{\pi}{2}x \ln(2-x)$

$= \frac{\ln(2-x)}{\cot\frac{\pi}{2}x} \to \frac{\frac{-1}{2-x}}{\frac{\pi}{2}(-\csc^2 x\frac{\pi}{2})}$

$\frac{1}{\frac{\pi}{2}\,1} = \frac{2}{\pi}$

$\lim_{x\to1} \ln y = \frac{2}{\pi}$

$e^{\frac{2}{\pi}} = y$

- ∞
- 0
- e
- e^{π}
- $e^{\frac{2}{\pi}}$ ✓

$$\lim_{x\to0} (\csc x - 1/x)$$

$\frac{1}{\sin x} - \frac{1}{x} = \frac{x - \sin x}{x \sin x}$

- ∞
- $\frac{1}{2}$
- 0 ✓
- 2
- 1

L'hôpital $\frac{1-\cos x}{\sin x + x\cos x} = \frac{1}{\sin x + x\cos x} - \frac{\cos x}{\sin x + x\cos x}$

$= \frac{\sin x(\sin x + x\cos x) - (1-\cos x)(\cos x - x\sin x)}{(\sin x + x\cos x)^2}$

$= \frac{\sin x}{\cos x + \cos x - x\sin x} = \frac{\sin x}{2\cos x - x\sin x} = \frac{0}{2-0} = 0$

$$\lim_{x\to\infty} \frac{\ln(\ln x)}{\sqrt{x}}$$

$\frac{\frac{1}{\ln x}\cdot\frac{1}{x}}{\frac{1}{2\sqrt{x}}} = \frac{1}{x\ln x}\cdot\frac{2\sqrt{x}}{1} = \frac{2}{\sqrt{x}\ln x} = 0$

- ∞
- 1
- 0 ✓
- $\sqrt{e}$
- e

RESULT

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$= \sin^2 x + 2x\cos x + x^2\cos^2 x$

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Test

Test: Calculus II - Integration Quiz 01

Number of Questions: 10

Time: 59 : 59

$$\int_{-2}^{0} (2x+5)\,dx$$

$x^2+5x\Big|_{-2}^{0}$

$= -(4-10)$

$=6$

- 4
- 5
- ✓ 6
- 7
- 8

$$\int_{0}^{\pi} \sin x\,dx$$

$-\cos x\Big|_0^{\pi}$

$= -(-1) - (-1) = 1+1=2$

- -1
- 0
- 1
- ✓ 2
- 3

$$\int_{0}^{\pi} \frac{1}{2}(\cos x + |\cos x|)\,dx$$

$=\frac{1}{2}\left(\int \cos x + \int |\cos x|\right)$

$=\frac{1}{2}\left(-\sin x\Big|_0^{\pi} + -\sin x\Big|_0^{\frac{\pi}{2}} + \sin x\Big|_{\frac{\pi}{2}}^{\pi}\right)$

$=\frac{1}{2}\left(0-1+(-1)\right) = (-2)\left(\frac{1}{2}\right) = -1$

- ✓ -1
- 1
- 0
- $1/2$
- $-1/2$

$$\int \frac{9r^2dr}{\sqrt{1-r^3}}$$

$(1-r^3)^{\frac{1}{2}} \to \frac{-3r^2}{2(1-r^3)^{\frac{1}{2}}} \cdot x^{-2\cdot 3} = \frac{9r^2}{(1-r^3)^{\frac{1}{2}}}$

$=$

-6

- [ ] $-2\left(1-r^3\right)^{1/2}+C$
- [ ] $2\left(1-r^3\right)^{1/2}+C$
- [x] $-6\left(1-r^3\right)^{1/2}+C$
- [ ] $-\left(1-r^3\right)^{1/2}+C$
- [ ] $\left(1-r^3\right)^{1/2}+C$

$x^3 \to 3x^2$

$2\sqrt{u} \to \frac{2}{\sqrt{u}} \cdot \frac{1}{2} = \frac{1}{\sqrt{u}}$

$$\int \frac{dx}{\sqrt{5x+8}}$$

$\frac{1}{\sqrt{u}} \to 2\sqrt{u} \quad \frac{2\sqrt{5x+8}}{5}$

- [ ] $\frac{8}{5}\sqrt{5x+8}+C$
- [x] $\frac{2}{5}\sqrt{5x+8}+C$
- [ ] $\frac{5}{2}\sqrt{5x+8}+C$
- [ ] $\frac{1}{2}\sqrt{5x+8}+C$
- [ ] $\frac{1}{5}\sqrt{5x+8}+C$

$g = 2\tan\frac{x}{2}$

$f' = \frac{7}{2}\tan^6\frac{x}{2}$

$$\int \underbrace{\tan^7\left(\frac{x}{2}\right)}_{f} \underbrace{\sec^2\left(\frac{x}{2}\right)}_{g'}\, dx = 2\tan^7\frac{x}{2}\tan\frac{x}{2} - \int \frac{7}{2}\tan^6\frac{x}{2} \cdot 2\tan\frac{x}{2}$$

$= 2\tan^8\frac{x}{2} - \int 7\tan^7\frac{x}{2}$

$= 2\tan^8\frac{x}{2} - \frac{7\tan^8\frac{x}{2}}{4} + C$

$= \frac{\tan^8\frac{x}{2}}{4} + C$

- [x] $\frac{1}{4}\tan^8\left(\frac{x}{2}\right)+C$
- [ ] $\frac{1}{4}\sec^8\left(\frac{x}{2}\right)+C$
- [ ] $\frac{1}{4}\cot^8\left(\frac{x}{2}\right)+C$
- [ ] $\frac{1}{4}\csc^8\left(\frac{x}{2}\right)+C$

- $\frac{1}{4}\sin^8\left(\frac{x}{2}\right) + C$

$\int xe^{2x}dx$

$\int fg' = fg - \int f'g$; $f = x$ $g = \frac{e^{2x}}{2}$ $f' = 1$ $g' = e^{2x}$

$\int xe^{2x} = \frac{xe^{2x}}{2} - \int \frac{e^{2x}}{2}$

- ✓ $\frac{1}{2}xe^{2x} - \frac{1}{4}e^{2x} + C$ $= \frac{xe^{2x}}{2} - \frac{e^{2x}}{4}$
- $\frac{1}{2}xe^{2x} + \frac{1}{4}e^{2x} + C$
- ~~$-\frac{1}{2}xe^{2x} - \frac{1}{4}e^{2x} + C$~~
- ~~$-\frac{1}{2}xe^{2x} + \frac{1}{4}e^{2x} + C$~~
- ~~$-\frac{1}{2}xe^{2x} + \frac{1}{2}e^{2x} + C$~~

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

$g' = \frac{1}{x+1}$
$g = \ln|x+1|$
$f = x^2$
$f' = 2x$

$\int \frac{x^2}{x+1}dx = x^2\ln|x+1| - \int 2x\ln|x+1| + C$

$(x-1)(x+1)$
$= x^2 - 1$
$x - 1 + \frac{1}{x+1}$
$= \frac{x^2-1+1}{x+1} = \frac{x^2}{x+1}$

$= \int x - 1 + \frac{1}{x+1}$
$= \frac{x^2}{2} - x + \ln|x+1|$

- $\frac{1}{2}x^2 + x - \ln|x+1| + C$
- ✓ $-\frac{1}{2}x^2 - x + \ln|x+1| + C$
- $\frac{1}{2}x^2 + x + \ln|x+1| + C$
- $\frac{1}{2}x^2 - x - \ln|x+1| + C$
- $\frac{1}{2}x^2 - x + \ln|x+1| + C$

$\int \frac{1}{\sqrt{a^2-u^2}} = \sin^{-1}\frac{u}{a} + C$

$\int \frac{1}{\sqrt{16-x^2}}dx$ $= ~~\int \frac{1}{4\sin\theta} - \int 4\csc\theta =~~$
$= \sin^{-1}\frac{x}{4}$

- $\arctan\left(\frac{x}{4}\right) + C$

- [ ] $\arccos\left(\frac{x}{4}\right) + C$
- [ ] $\frac{1}{4}\arccos\left(\frac{x}{4}\right) + C$
- [ ] $\frac{1}{4}\arcsin\left(\frac{x}{4}\right) + C$
- [x] $\arcsin\left(\frac{x}{4}\right) + C$

$\int x^k = \frac{x^{k+1}}{k+1} + C$

$$\int_2^\infty x^{-3/2}\,dx$$

$\cancel{\frac{-3x^{-5/2}}{2}\Big|_2^\infty = \frac{-3}{2x^{5/2}}\Big|_2^\infty = 0 + \frac{3}{2\sqrt{32}} = \frac{3}{8\sqrt{2}}}$

$\cancel{\frac{x^{-1/2}}{-2}\Big|_2^\infty \to \frac{-1}{2\sqrt{x}}\Big|_2^\infty = 0 + \frac{1}{2\sqrt{2}} \quad \frac{1}{\sqrt{8}}}$

- [ ] ∞
- [ ] $-\infty$
- [ ] $\sqrt{5}$
- [ ] $\sqrt{3}$
- [x] $\sqrt{2}$

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$x^{-\frac{3}{2}} \to \frac{x^{-\frac{1}{2}}}{-\frac{1}{2}} = \frac{-2}{\sqrt{x}}\Big|_2^\infty = 0 + \frac{2}{\sqrt{2}} = \sqrt{2}$