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1. (1 point) Select the following which are separable equations.

- A. $y'y = 2$
- B. $\frac{dy}{dx} = e^{xy}$
- C. $y' = xe^y + ye^x$
- D. $\frac{dy}{dx} = x\cos(y) + x$
- E. $\frac{dy}{dx} = e^{e+2y}$
- F. $y' = 2y$
- G. $x\frac{dy}{dx} - y = 0$
- H. $\frac{dy}{dx} + \sin(xy) = 0$
- I. $y' = x + y$
- J. None of the above

Solution:
SOLUTION:
The correct answer is ADEFG.
Correct Answers:

- `ADEFG`

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2. (1 point) Find the general solution of the differential equation

$$y' = e^{5x} - 3x.$$

(Don't forget +C.)

$y =$ __________ help (formulas)

Solution:
SOLUTION:
Rearranging $\frac{dy}{dx} = e^{5x} - 3x$ with all y-stuff on the left and x-stuff on the right gives $dy = \left(e^{5x} - 3x\right) dx$. Integrating both sides and combining the constants as C gives

$$y = \frac{1}{5}e^{5x} - \frac{3}{2}x^2 + C,$$

which is our answer.
Correct Answers:

- `0.2*e^(5*x)-1.5*x^2+C`

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3. (1 point) Using separation of variables, solve the differential equation,

$$(10 + x^8)\frac{dy}{dx} = \frac{x^7}{y}.$$

Use **C** to represent the arbitrary constant.
$y^2 =$ ______________
Solution:
SOLUTION
After separating and writing in differential form, the equation becomes,

$$ydy = \frac{x^7}{10 + x^8}dx.$$

Integrating on both sides yields,

$$\frac{y^2}{2} = \frac{1}{8}\ln(10 + x^8) + C.$$

Therefore,

$$y^2 = \tfrac{1}{4}\ln\left(10 + x^8\right) + C.$$

Correct Answers:

- `0.25*ln(10+x^8)+C`

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4. (1 point) Evaluate the indefinite integral using substitution. (Use C for the constant of integration.)

$$\int \frac{x^2}{\sqrt{x^3 - 1}}\,dx = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_$$

Solution: Substitute $u = x^3 - 1$. Then $du = 3x^2\,dx$.

$$\begin{aligned}\int \frac{x^2}{\sqrt{x^3 - 1}}\,dx &= \frac{1}{3}\int u^{-1/2}\,du \\ &= \frac{1}{3}\cdot 2u^{1/2} + C \\ &= (2/3)\sqrt{x^3 - 1} + C.\end{aligned}$$

Correct Answers:

- `0.666667*sqrt(x^3+(-1))+C`

5. (1 point) Evaluate the following indefinite integral.
$\int xe^{2x}\,dx =$ ______________________ $+C$.

Solution:

SOLUTION:

Integration by parts with $u = x$ and $dv = e^{2x}\,dx$ gives thge answer $\frac{1}{2}\left(xe^{2x} - \frac{1}{2}e^{2x}\right) + C$, or $\frac{e^{2x}}{2}\left(x - \frac{1}{4}\right) + C$.

Correct Answers:

- `1/2*[x*e^(2*x)-1/2*e^(2*x)]`

6. (1 point) Find the general solution of the differential equation

$$y' = e^{6x} - 2x.$$

(Don't forget +C.)

$y =$ _________ help (formulas)

Correct Answers:

- `0.166667*e^(6*x)-1*x^2+C`