

1. (1 point) Select the following which are homogeneous functions.

- A. $f(x,y) = \sqrt{x^3 + y^3}$
- B. $f(x,y) = x^3 y^3$
- C. $f(x,y) = x^2 y^3 - y^5 + x^4 y$
- D. $f(x,y) = x^3 y^4 + x^3 + y^4$
- E. $f(x,y) = \frac{x}{y}$
- F. $f(x,y) = x + \sqrt{y}$
- G. $f(x,y) = x^2 \sin(y^2)$
- H. $f(x,y) = x^3 + y^4$
- I. $f(x,y) = x^3 + y^3$
- J. None of the above

Solution:

SOLUTION:

The correct answer is ABCEI.

Correct Answers:

- ABCEI

2. (1 point) Consider the function $f(x,y) = x^2 y^5 - x^5 y^2$.

The function $f(x,y)$ is homogeneous of degree _____.

Solution: We have

$$f(tx,ty) = (tx)^2 (ty)^5 - (tx)^5 (ty)^2 = t^{2+5} x^2 y^5 - t^{2+5} x^5 y^2 = t^7 f(x,y).$$

Thus, the degree is 7.

Correct Answers:

- 7

3. (1 point) Select the following which are 1st-order homogeneous differential equations.

- A. $y' = x^3 + y^4$
- B. $y' = x^2 y^3 - y^5 + x^4 y$
- C. $y' = \frac{x^3 y^3}{x^2 y^4}$
- D. $y' = \frac{x^3 + y^3}{xy^2}$
- E. $x^2 dx + y^3 dy = 0$
- F. $x^2 dx + xy dy = 0$
- G. $y' = x^3 + y^3$
- H. $y' = x^3 y^3$
- I. None of the above

Solution:

SOLUTION:

The correct answer is CDF.

Correct Answers:

- CDF

Making the appropriate substitution, the differential equation $\frac{dy}{dx} = \frac{x^2}{x^2 + y^2}$ can be reduced to which of the following expressions? (Note: to solve the DE, one would then solve the separable equation, and make the required substitution back to x and y terms.)

- A. $\frac{1+u^2}{1+u+u^3} du = \frac{1}{x} dx$

- B. $\frac{1+u+u^3}{1+u^2} du = \frac{1}{x} dx$

- C. $\frac{1-u-u^3}{1+u^2} du = \frac{1}{x} dx$

- D. $\frac{1+u^2}{1-u-u^3} du = x dx$

- E. $\frac{1+u^2}{1-u-u^3} du = \frac{1}{x} dx$

Solution:

SOLUTION:

The correct answer is E.

Correct Answers:

- E

5. (1 point)

Enter a value for π

Correct Answers:

- 3.14159