

Calculus Test 2 Prep

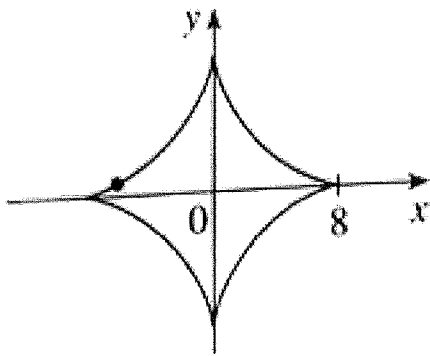
****Review for Quiz 6 (Sec 2-5 to 2-6)****

Find dy/dx

11. $y \cos x = x^2 + y^2$

30. Find dy/dx at the indicated point: *And the eq. of the tangent line.*

$x^{2/3} + y^{2/3} = 4$, $(-3\sqrt{3}, 1)$ (astroid)



Find y''

35. $x^2 + 4y^2 = 4$

19. $\lim_{x \rightarrow \infty} \frac{\sqrt{x + 3x^2}}{4x - 1}$

27. $\lim_{x \rightarrow -\infty} (x^2 + 2x^7)$

$\lim_{x \rightarrow \infty} \frac{\cos x}{x^3}$

5. A cylindrical tank with radius 5 m is being filled with water at a rate of $3 \text{ m}^3/\text{min}$. How fast is the height of the water increasing?
13. A plane flying horizontally at an altitude of 1 mi and a speed of 500 mi/h passes directly over a radar station. Find the rate at which the distance from the plane to the station is increasing when it is 2 mi away from the station.
- What quantities are given in the problem?
 - What is the unknown?
 - Draw a picture of the situation for any time t .
 - Write an equation that relates the quantities.
 - Finish solving the problem.
17. Two cars start moving from the same point. One travels south at 60 mi/h and the other travels west at 25 mi/h. At what rate is the distance between the cars increasing two hours later?

Calculus Test 2 Prep

Key

Review for Quiz 6 (Sec 2-5 to 2-6)

Find dy/dx

11. $y \cos x = x^2 + y^2$

$(y)^2$

$$\frac{dy}{dx} \cos x - y \sin x = 2x + 2y \frac{dy}{dx} \rightarrow$$

$$\frac{dy}{dx} \cos x - 2y \frac{dy}{dx} = 2x + y \sin x$$

$$\frac{dy}{dx} (\cos x - 2y) = 2x + y \sin x$$

$$\frac{dy}{dx} = \frac{2x + y \sin x}{\cos x - 2y}$$

30. Find dy/dx at the indicated point: & tangent line

$x^{2/3} + y^{2/3} = 4$, $(-3\sqrt{3}, 1)$ (astroid)

$\frac{2}{3} x^{-1/3} + \frac{2}{3} y^{-1/3} \frac{dy}{dx} = 0$
 $\frac{2}{3} (-3\sqrt{3})^{-1/3} + \frac{2}{3} (1)^{-1/3} \frac{dy}{dx} = 0$
 $-0.385 + \frac{2}{3} \frac{dy}{dx} = 0$
 $\frac{\frac{2}{3} \frac{dy}{dx}}{\frac{2}{3}} = \frac{0.385}{\frac{2}{3}}$
 $\frac{dy}{dx} = 0.577$

$$y - 1 = 0.577(x + 3\sqrt{3})$$

Find y''

35. $x^2 + 4y^2 = 4$

$$2x + (8y)y' = 0$$

$$2 + 8y'y' + 8yy'' = 0$$

$$8yy'' = -2 - 8(y')^2$$

$$y'' = \frac{-2 - 8(y')^2}{8y} = \frac{-1 - 4(y')^2}{4y}$$

19. $\lim_{x \rightarrow \infty} \frac{\sqrt{x + 3x^2}}{4x - 1}$

.433

$$\frac{\sqrt{3}}{4}$$

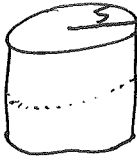
27. $\lim_{x \rightarrow -\infty} (x^2 + 2x^7)$

$-\infty$

$\lim_{x \rightarrow \infty} \frac{\cos x}{x^3}$

0

5. A cylindrical tank with radius 5 m is being filled with water at a rate of $3 \text{ m}^3/\text{min}$. How fast is the height of the water increasing?



$$\frac{dV}{dt} = 3$$

$$\frac{dr}{dt} = 0$$

$$V = (\pi r^2)h$$

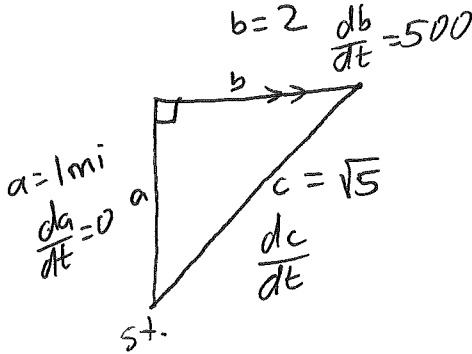
$$\frac{dV}{dt} = 2\pi r \frac{dr}{dt} h + \pi r^2 \frac{dh}{dt}$$

$$3 = 0 + \pi 5^2 \frac{dh}{dt}$$

$$\frac{3}{\pi 25} = \frac{dh}{dt} = .038 \text{ m/min}$$

13. A plane flying horizontally at an altitude of 1 mi and a speed of 500 mi/h passes directly over a radar station. Find the rate at which the distance from the plane to the station is increasing when it is 2 mi away from the station.

- What quantities are given in the problem?
- What is the unknown?
- Draw a picture of the situation for any time t .
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- Finish solving the problem.



$$a^2 + b^2 = c^2$$

$$2^2 + 1^2 = c^2$$

$$\sqrt{5} = c$$

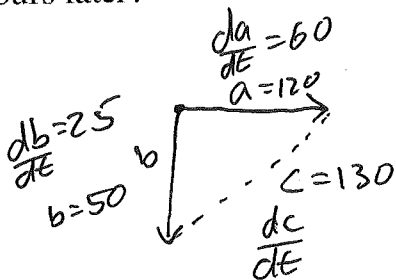
$$a \frac{da}{dt} + b \frac{db}{dt} = c \frac{dc}{dt}$$

$$1 \cdot 0 + 2(500) = \sqrt{5} \frac{dc}{dt}$$

$$\frac{1000}{\sqrt{5}} = \frac{dc}{dt}$$

$$447.214 \text{ mi/h}$$

17. Two cars start moving from the same point. One travels south at 60 mi/h and the other travels west at 25 mi/h. At what rate is the distance between the cars increasing two hours later?



$$a^2 + b^2 = c^2$$

$$120^2 + 50^2 = c^2$$

$$c = 130$$

$$a \frac{da}{dt} + b \frac{db}{dt} = c \frac{dc}{dt}$$

$$120(60) + 50(25) = 130 \frac{dc}{dt}$$

$$8450 = 130 \frac{dc}{dt}$$

$$65 = \frac{dc}{dt}$$

$$65 \text{ mi/h}$$