

- ① FIND THE CENTER AND RADIUS OF THE CIRCLE  $x^2 + y^2 - 10x + 12y - 20 = 0$ .
- ② FIND THE SLOPE-INTERCEPT FORM FOR THE LINE WHICH IS PERPENDICULAR TO THE LINE  $2x - 10y = 15$  AND WHICH PASSES THROUGH THE MIDPOINT OF THE LINE SEGMENT BETWEEN  $(8, 3)$  AND  $(14, 9)$ .

③ SOLVE THE INEQUALITY  $\frac{x^2 - x - 30}{x^3(x-4)^2} \leq 0$ .

④ FIND THE DOMAIN OF  $f(x) = \ln\left(\frac{x^3 + 3x^2}{16 - x^2}\right)$ .

⑤ USE AN ADDITION FORMULA TO SIMPLIFY  $\cos\left(x - \frac{3\pi}{2}\right)$ .

⑥ USE AN ADDITION FORMULA TO FIND  $\sin 75^\circ$ .

⑦ EVALUATE: a)  $\ln e^6 + e^{2 \ln 5}$

b)  $7 \log_7 4 + 18 \log_2 \sqrt[3]{2}$

c)  $\log_8 96 - \log_8 6$

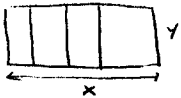
⑧ IF  $f(x) = \sqrt{5x^2 + 8}$ , FIND AND SIMPLIFY  $\frac{f(x+h) - f(x)}{h}$ .

- ⑨ SIMPLIFY THE FOLLOWING EXPRESSION, SO THAT LOGARITHMS OF PRODUCTS, QUOTIENTS, AND POWERS DO NOT APPEAR:

$$\ln\left(\frac{x^9 \sqrt{x^2 + 4}}{\sqrt{x-3}(5x+1)^7}\right)$$

⑩ SOLVE THE EQUATION  $3x(\ln x)^3 - 12x(\ln x) = 0$ .

- ⑪ A RANCHER HAS 600 FT OF FENCING TO BUILD 4 ADJACENT RECTANGULAR CORRALS, FIND THE VALUES OF  $x$  AND  $y$  SO THAT THE TOTAL ENCLOSED AREA IS A MAXIMUM.



⑫ IF  $f(x) = \frac{1}{2x^3 + 3}$ , FIND AND SIMPLIFY  $\frac{f(t) - f(x)}{t - x}$ .

- ⑬ FIND THE POINT ON THE CURVE  $y = \sqrt{x^2 - 2x + 22}$  WHICH IS CLOSEST TO THE POINT  $(5, 0)$ .

- ⑭ FIND ALL ANGLES  $\theta$  (IN RADIANS) WITH  $0 \leq \theta < 2\pi$  WHICH SATISFY THE EQUATION  $2 \sin^2 \theta - \cos \theta - 2 = 0$ .

- ⑮ SIMPLIFY THE FOLLOWING EXPRESSIONS:

a)  $x^3 \cdot \frac{1}{2} (5x+7)^{-1/2} \cdot 5 + 3x^2 \sqrt{5x+7}$

b)  $\frac{(x^2 + 48)^2 (-2x) - (48 - x^2) \cdot 2(x^2 + 48) \cdot 2x}{(x^2 + 48)^4}$

16) Give an equation of the graph which results from performing each of the following operations on the graph of  $y = f(x)$ :

a) shift 4 units up, and then reflect in the x-axis. \_\_\_\_\_

b) reflect in the y-axis, and then shift 5 units to the right. \_\_\_\_\_

c) shift 3 units to the left, reflect in the line  $y = x$ , and then shift 8 units up. \_\_\_\_\_

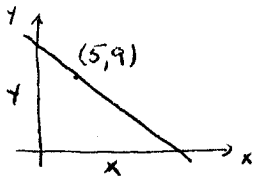
17) If  $\tan \theta = 3$  and  $\pi < \theta < \frac{3\pi}{2}$ , find each of the following:

a)  $\cos \theta$       b)  $\sin \theta$       c)  $\cos 2\theta$       d)  $\sin 2\theta$

18) a) Find  $\cos \left( 2 \sin^{-1} \frac{3}{7} \right)$ ,

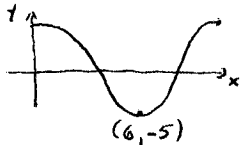
b) if  $x = 2 \sin \theta$  and  $0 < \theta < \frac{\pi}{2}$ , express  $3\theta - 10 \sin 2\theta$  in terms of  $x$  (and simplify your answer),

19) A triangle is formed in the first quadrant by a line through the point  $(5, 9)$  and the x- and y-axes. Express the area of the triangle as a function of  $x$ .



20) a) Find an equation for the slanted asymptote to the graph of  $y = \frac{x^3 + 5x^2}{x^2 - 3x + 1}$ .

b) Find an equation of the form  $y = A \sin Bx$  or  $y = A \cos Bx$  for the graph below:



21) Express  $\cos^2 4\theta + \sin^2 3\theta$  in a form that does not involve powers of trig functions,

22) A field with a perimeter of 400 m consists of a rectangle with a semicircle at each end. Find the values of  $x$  and  $r$  which will maximize the area of the rectangular portion of the field.



23) For the function  $y = \frac{(2x+2)(x-3)}{(x+3)(x-2)}$ ,

a) Find equations for the asymptotes to the graph, vertical: \_\_\_\_\_ horizontal: \_\_\_\_\_

b) Use the sign chart below to sketch the graph, showing the asymptotes, intercepts, and any points of intersection with the horizontal asymptote.



24) If a sample of a radioactive substance decreases from 9 mg to 7 mg in 11 years, how long does it take for 10% of the sample to disintegrate?