

1. True or False:

- (a) Any two distinct points in the plane determine exactly one line.
- (b) Any line can be written in the form  $y = mx + b$ .
- (c) The graph of any circle is symmetric with respect to the origin.
- (d) If a graph has two points with the same  $y$ -coordinate, then it is not the graph of a function  $y = f(x)$ .
- (e) Every function  $y = f(x)$  has at least one  $x$ -intercept.

2. Given the points  $A(2, -2)$  and  $B(-1, 4)$ :

- (a) Find  $d(A, B)$
- (b) Find the midpoint of the line segment containing  $A$  and  $B$ .
- (c) Find the equation for the line containing  $A$  and  $B$  in general form.
- (d) Find the perpendicular bisector of the line segment containing  $A$  and  $B$ .
- (e) Find the equation for the circle centered at  $B$  containing the point  $A$ .
- (f) Find an equation for the vertical line containing  $B$ .
- (g) Find an equation for the horizontal line containing  $A$ .

3. Find the equation for the following circles:

- (a) The circle with center  $(4, -5)$  and radius  $\sqrt{15}$
- (b) The circle with diameter passing through the points  $(2, -2)$  and  $(-4, -2)$
- (c) The circle with center  $(2, 1)$  and passing through the point  $(5, 5)$

4. Graph the circle with equation  $x^2 + y^2 + 4x - 6y - 3 = 0$

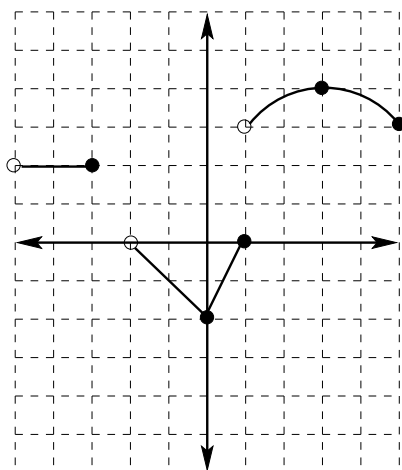
5. Determine whether or not the following equations are symmetric with respect to the  $x$ -axis,  $y$ -axis, or the origin.

- (a)  $y = x^4 - x^2$
- (b)  $y = x^3 - 2x$
- (c)  $x^2 - y^2 = 1$
- (d)  $y = 3x - 2$

6. Sketch the graphs of the following functions. Be sure to find and label all  $x$  and  $y$  intercepts.

- (a)  $f(x) = -\frac{3}{4}x + 2$
- (b)  $g(x) = x^3 - 4x$
- (c)  $y = \sqrt{x - 4}$
- (d)  $y = 4 - x^2$

7. For the given graph of  $f(x)$ , find the following:



- (a)  $f(0)$
- (b)  $f(3)$
- (c)  $x$ , when  $f(x) = 2$
- (d) The domain of  $f$
- (e) The range of  $f$
- (f) The intervals where  $f$  is decreasing.

8. Let  $f(x) = x^2 - 2x$ . Find and simplify the following:

- (a)  $f(2)$ , and  $f(\frac{2}{3})$
- (b)  $f(a + 3)$
- (c)  $f(2a - 1)$
- (d)  $\frac{f(a + h) - f(a)}{h}$

9. Determine whether or not the following are functions:

- (a)  $\{(3, 4), (5, 7), (2, -1), (6, 8), (8, 6)\}$
- (b)  $\{(1, 2), (3, 7), (4, -12), (5, 8), (7, 2)\}$
- (c)  $\{(1, 2), (2, 3), (3, 4), (4, 5), (3, 5)\}$

10. Find the domain of the following functions (put your answers in interval notation):

- (a)  $f(x) = \frac{2x+7}{2x^2-3x-2}$
- (b)  $f(x) = \frac{x^2+x-2}{x^2-4}$
- (c)  $f(x) = \frac{\sqrt{4-2x}}{x^2-1}$
- (d)  $f(x) = \frac{4}{\sqrt{3x-5}}$
- (e)  $f(x) = \frac{\sqrt{3-2x}}{2x^2+x-15}$

11. Given that  $f(x) = \sqrt{2x-2}$  and  $g(x) = \frac{4}{3x-2}$

- (a) Find  $g(6)$  and  $f(3a + 1)$
- (b) Find  $\frac{g}{f}(3)$
- (c) Find  $f \circ g(2)$

12. Given that  $f(x) = \sqrt{3x-2}$  and  $g(x) = x^2 - 4$

- (a) Find  $g \circ f(x)$
- (b) Find  $f \circ g(x)$
- (c) Find the domain of  $g \circ f(x)$ . Give your answer in interval notation.
- (d) Find the domain of  $\frac{f}{g}$ . Give your answer in interval notation.
- (e) Find  $\frac{g(a+h) - g(a)}{h}$ . Simplify your answer.

13. An oil well off the Gulf Coast is leaking, with the leak spreading oil over the surface in the shape of a circle. At any time  $t$ , in minutes, after the beginning of the leak, the radius of the circular oil slick on the surface is  $r(t) = 4t$  feet. Let  $A(r) = \pi r^2$  represent the area of the circle of radius  $r$ .

- (a) Find  $(A \circ r)(t)$
- (b) Explain what  $(A \circ r)(t)$  is in practical terms.