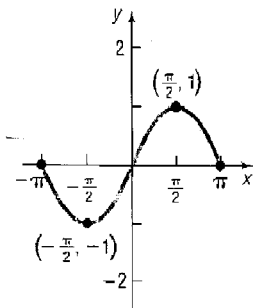


Solution

1. The graph of  $y = f(x)$  is shown below:



- a. Is  $f(x)$  even, odd, or neither?  $000$
- b. What is  $f(\frac{\pi}{2})$ ?  $1$
- c. List any intervals on which  $f(x)$  is decreasing.  
 $(-\pi, -\frac{\pi}{2})$   
 $(\frac{\pi}{2}, \pi)$
- d. Identify any local maxima of  $f(x)$   $x = \frac{\pi}{2}, f(x) = 1$
- e. How often does the line  $y = \frac{1}{2}$  intersect the graph?  $2$

2. Let  $f(x) = x^2 + 1$ .

a. Find the average rate of change of  $f(x)$  from  $-1$  to  $2$ .

$$\frac{f(2) - f(-1)}{2 - (-1)} = \frac{(2^2 + 1) - (-1^2 + 1)}{3} = \frac{3}{3} = 1$$

b. Find the average rate of change of  $f(x)$  from  $1$  to  $u$ .

$$\frac{f(u) - f(1)}{u - 1} = \frac{u^2 + 1 - (1^2 + 1)}{u - 1} = \frac{u^2 - 1}{u - 1} = \frac{(u-1)(u+1)}{u-1} = u+1$$

$u \neq 1$

~~110~~  
~~210~~

3. Say whether each of the following is an *exponential* function of  $x$

a.  $f(x) = 2^x$       yes

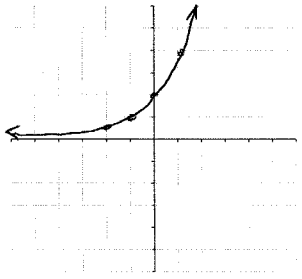
b.  $f(x) = x^5$       no

c.  $f(x) = e$       no

d.  $f(x) = e^x$       yes

4. Sketch the graph of  $y = 2^{x+1}$ . Label 3 points on the graph (you can make a table and then just mark the points on the graph, if you like).

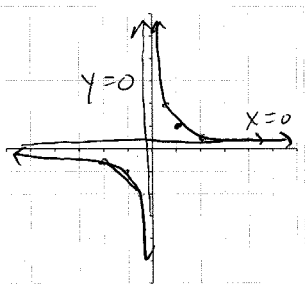
~~130~~



x	y
-1	$2^0 = 1$
0	$2^1 = 2$
1	$2^2 = 4$
-2	$2^{-1} = \frac{1}{2}$

5. Sketch the graph of  $f(x) = \frac{1}{x}$ . Label 3 points on the graph. (you can make a table and then just mark the points on the graph, if you like). Label any asymptotes.

~~130~~

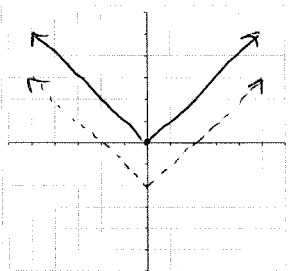


x	y
1	1
2	$\frac{1}{2}$
-1	-1
-2	$-\frac{1}{2}$
$\frac{1}{2}$	2

$y = 0$   
 $x = 0$

~~130~~

6. Sketch the graph of  $y = |x|$ . Say how would you use this to sketch the graph of  $f(x) = |x| - 2$  and then go ahead and sketch that too; on the same graph.



Shift down 2

~~11.3.15~~  
~~130~~

7. If  $f(x) = 2x$  and  $g(x) = 3x^2 + 1$  then evaluate:

a.  $f(g(4)) = f(3 \cdot 4^2 + 1) = 2 \cdot 49 = 98$

~~100~~

b.  $g(f(2)) = g(2 \cdot 2) = 3 \cdot 4^2 + 1 = 49$

c.  $g(g(0)) = g(1) = 3 \cdot 1^2 + 1 = 4$

8. Solve  $3^x = \frac{1}{9}$  for  $x$

$$3^x = \frac{1}{9} = \frac{1}{3^2} = 3^{-2}$$

~~30~~

$$x = -2$$

9. Logarithms and exponents:

a. Write the equation  $\log_b(4) = 2$  as an equivalent equation involving an exponent

$$b^2 = 4$$

~~12.23.25~~

~~20~~

b. Write the equation  $e^x = 8$  as an equivalent equation involving a logarithm

$$\log_e(8) = x$$

10. The price,  $p$  (in dollars), of a DVD and the quantity sold,  $x$ , are related by the equation



$$x = -5p + 100 \quad 0 \leq p \leq 20$$

- a. Write the revenue  $R$  as a function of  $x$ . Write your answer in the form  $R(x) = \underline{\hspace{2cm}}$
- b. What is the revenue if 15 DVD's are sold?
- c. What is the largest value of  $x$  that makes sense? The smallest?
- d. What is the domain of  $R(x)$ ?

(a)  $R(x) = x \cdot p$

$$x = -5p + 100$$

$$\frac{100 - x}{5}$$

$$R(x) = x \left( 20 - \frac{1}{5}x \right)$$

$$5p = 100 - x$$

$$p = 20 - \frac{1}{5}x$$

(b)  $R(15) = 15 \left( 20 - \frac{1}{5} \cdot 15 \right)$

$$= 15 \cdot (20 - 3)$$

$$= 15 \cdot 17$$

$$= \$255$$

Only counted  
(a) & (b)

(c) Largest value:

$$p = 0 \rightarrow$$

$$x = 100$$

(Price can't be less than 0!)

Smallest:

$$x = 0$$

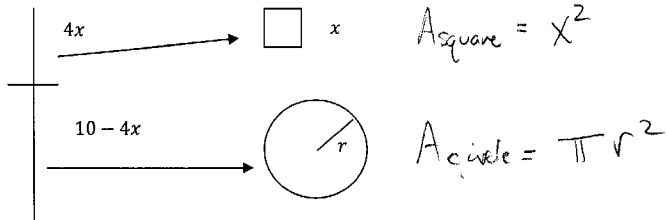
(d)

$$\text{domain} = [0, 100]$$

extra credit

11. EXTRA CREDIT

A wire 10 meters long is cut in 2 pieces – one shaped as a square with side  $x$  meters, the other shaped as a circle.



- a. Express the total area (sum of the areas of the square and circle) as a function of  $x$ . Write the answer as  $A(x) = \underline{\hspace{2cm}}$  It is not necessary to simplify the answer.  
Hint: what is the circumference of the circle? How does the radius relate to the circumference?
- b. What is the domain of  $A(x)$ ?

(a)  $A = A_{\text{square}} + A_{\text{circle}}$

$$= x^2 + \pi r^2$$

What is  $r$ ? Circumference -  $2\pi r = 10 - 4x$

$$r = \frac{10 - 4x}{2\pi}$$

$$A(x) = x^2 + \pi \left( \frac{10 - 4x}{2\pi} \right)^2$$

(b) Minimum  $x = 0$

Maximum  $x$ :  $4x = 10$  (use whole wire for the square)  
 $x = 2.5$

Domain  $0 \leq x \leq 2.5$  meters