## ALGEBRA PROBLEM SESSION \# 2 PRACTICE PROBLEMS

## Introduction to Functions

1. Explain in your own words what a function is.
2. Determine whether $(2,3),(2,4)$ and $(2,5)$ is a function. 3. Determine whether $(0,3),(1,3)$ and $(2,3)$ is a function.
3. If $P(x)=x^{2}-5 x$, is $P(2)+P(3)=P(2+3)$ ?
4. If $P(x)=x^{2}-3 x$, is $P(2)-P(3)=P(2-3)$ ?
5. If $P(x)=x^{2}-2 x-3$, find $P(0)$.
6. If $P(x)=2 x^{2}-x-5$, find $P(-1)$.
7. Given that $f(x)=4 x^{2}+x-7$, find each of the following. Then discuss how each expression differs from the other: (a) $f(x)+2 \quad$ (b) $\quad f(x+2)$ (c) $\quad f(x)+f(2)$
8. Is it ever true that for $f(x)=4 x^{2}+x-7, f(a+b)=f(a)+f(b)$ ? If so, give an example of such $a$ and $b$.
9. Suppose that for some function $f, f(x-1)=5 x$. Find $f(6)$.

## Graphs of Functions

1. Discuss why the graph of a vertical line $x=a$ cannot represent y as a function of x .
2. Explain why the vertical line test for determining if the graph of a relation is a function works.
3. Graph $f(\mathrm{x})=\mathrm{x}^{2}, f(\mathrm{x})=2 \mathrm{x}^{2}$, and $\mathrm{f}(\mathrm{x})=4 \mathrm{x}^{2}$. What do you discover?
4. Graph $f(\mathrm{x})=\mathrm{x}^{2}, f(\mathrm{x})=\frac{1}{2} \mathrm{x}^{2}$, and $f(\mathrm{x})=\frac{1}{4} \mathrm{x}^{2}$. What do you discover?
5. Graph $\mathrm{y}=m x-1$ for $m=-2,-1,0,1$, and 2 simultaneously in the same coordinate system. Verbally describe the geometric significance of $m$.
6. Compare the graph of $f(x)=|x|$ with that of $g(x)=x$.
7. A cab company charges $\$ 2$ for a trip up to 1 mile, and $\$ 1.50$ for every extra mile (or portion of a mile). Draw a graph representing the cost $(c)$ of a trip as a function of miles $(m)$ traveled.
8. Graph $f(x)=2 x$ and $g(x)=2 x-1 \quad$ 9. Graph $f(x)=|x|$ and $g(x)=|x|+1 \quad$ 10. Graph $f(x)=x^{2}$ and $g(x) x^{2}-4$

## Working with Functions

1. If a function is defined by an equation, explain how to find its domain.
2. Find the domain of $\mathrm{f}(\mathrm{x})=\frac{12 x}{x-5} \quad$ 3. Find the domain of $\mathrm{f}(\mathrm{x})=\frac{2}{x+5}+\frac{3}{x-7}$
3. Find $(f+g)(x)$ and $(f+g)(4)$ when $\mathrm{f}(\mathrm{x})=2 \mathrm{x}-3$ and $\mathrm{g}(\mathrm{x})=3 \mathrm{x}^{2}$.
4. Find the domain of $f+g$ when $\mathrm{f}(\mathrm{x})=7 \mathrm{x}+4$ and $\mathrm{g}(\mathrm{x})=\frac{2}{x-6}$.
5. When $\mathrm{f}(\mathrm{x})=\mathrm{x}^{2}+1$ and $\mathrm{g}(\mathrm{x})=\mathrm{x}^{3}-1$, find the domain and range of: (a) $f(\mathrm{x})=4 \mathrm{x}-1 \quad$ b. $f(x)=\frac{4}{2-x}$
6. If $f(x)=x^{2}+2 x$ and $g(x)=3-x$ find:
b. $(f-g)(x)$ and $(f-g)(4)$
c. $f(-4)+g(-5)$
c. $(\mathrm{fg})(-3)$
d. $(f / g)(-2)$
7. Let $f(x)=2 x+1$ and $g(x)=x^{2}$. Assume that $f(x) \neq 0$ and $g(x) \neq 0$. Is $f(x)+g(x)$ equal to $g(x)+f(x)$ ? Is $f(x)-g(x)$ equal to $g(x)-f(x) ? \backslash$
8. For the indicated functions f and g , find the functions $\mathrm{f}+\mathrm{g}, \mathrm{f}-\mathrm{g}, \mathrm{fg}$, and $\mathrm{f} / \mathrm{g}$ and find their domains.

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f(x)=x+\frac{1}{x} g(x)=x-\frac{1}{x} \quad f(x)=x-1 \quad g(x)=x-\frac{6}{x-1} \quad f(x)=1-\frac{x}{|x|} \quad g(x)=1+\frac{x}{|x|}
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Selected problems were taken from Blitzer Algebra For College Students

