Mathematics for Political Science

Day 1: Introduction & Foundations

Exercise Solutions

1.

1. dichotomous, discrete, or continuous:
   - dichotomous: wireless
   - discrete: wireless, atmosphere, area
   - continuous: coffee
2. categorical, ordinal, interval, or ratio
   - categorical: area
   - ordinal: atmosphere
   - interval: wireless
   - ratio: coffee

2.

- $f(g(x)) = 49 - 28x^3 + 4x^6$
- $g(f(x)) = 2(3-x)^6 - 4$

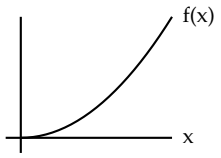
x	$f(x) = (3-x)^2$	$g(x) = 2x^3 - 4$	$f(g(x))$	$g(f(x))$
2	1	12	81	-2
4	1	124	14641	-2
5	4	246	59049	124
1	4	-2	25	124
0	9	-4	49	1454
1	4	-2	25	124

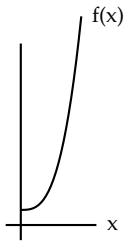
3.

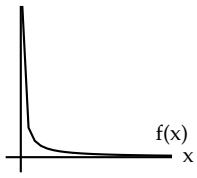
1. $g(x) = 8x - 2, f(x) = 4x^3$
2. $g(x) = 3x - 2, f(x) = 1/x$

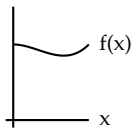
4. The open interval does not include the endpoint. Since the interval is limited by (but does not include) 1, it would be possible to get infinitely close to (but never reach) that point, and any number less than 1 has another point greater than that but less than 1.

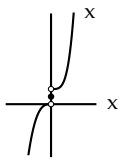
5.

1. 

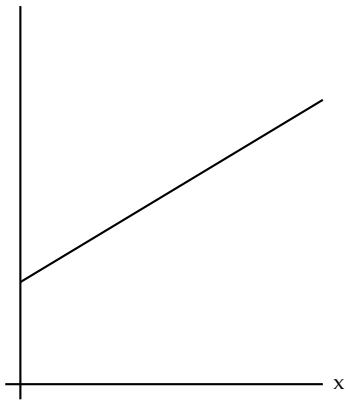
2. 

3. 

4. 

5. 

6. $p \approx 282,200,000 + 2,800,000 * y$

7. 

Increasing unemployment by 5% increases homicides by approximately 12.05, regardless of the prior level of unemployment.

8. ConCAVE looks like the entrance to a cave, conVex looks like a V.

9.

1. monotonic
2. non-monotonic
3. non-monotonic

10.

1. 39/2
2. 288

11.

a. $-x^8y^4$	b. 9	c. $8a^6$
d. x	e. $y^3 + y^4 + y^5$	f. $\frac{10a}{77b}$
g. $4 - \ln(3)$	h. 0	i. 720

12.

1. a^2
2. $3pq^2 + 6p^2q + 3p^3 - pq + x(4q^2 + 16pq + 16p^2)$

13.

1. B wins 29,000 to 28,000
2. $265,625 more, for a total of $1,265,625

14. $56,000$