1. Please answer the following questions (3 points each) 15 pt

(a) Let \( F_N \) be the \( N \)th Fibonacci number. Write down the recursive rule satisfied by the Fibonacci numbers. ( )

(b) Given \( F_{13} = 233, F_{14} = 377 \). what is the value of \( F_{12} \)? ( )

(c) What is the exact value of the golden ratio? ( )

(d) Assume linear growth model. If the initial population is \( P_0 \) and the common difference is \( d \). What is the population of the \( N \)'s generation? ( )

(e) What types of symmetry does a square have? ( )

2. ( 2pt each) Determine whether the following statements are true or false. 20 pt

(a) \( \sqrt{5} \) is an irrational number. ( )

(b) The sequence of Fibonacci numbers is a geometric sequence? ( )

(c) Any two squares are similar. ( )

(d) The line graph of an exponential growth model is a straight line. ( )

(e) 2, 5, 8, 10, \( \cdots \) can be the first few terms of an arithmetic sequence. ( )

(f) An improper rigid motion will reverse left-right orientation but preserve clockwise-counterclockwise orientation. ( )

(g) A reflection is completely determined by the axis of reflection. ( )

(h) A vector is a line segment with direction. ( )

(i) Given any two different points \( P \) and \( P' \) in the plane. There are only one rotation which moves \( P \) to \( P' \). ( )

(j) The type of symmetry for letter “A” is \( Z_2 \). ( )

3. ( 5 pts each) Multiply choice questions. Please choose one of the following answers. 40 pt

(a) The value of \( 1 + 3 + 5 + \cdots + 101 \) is
   A). 2499; B). 2550; C). 2652; D). 2601 ( )

(b) The value of \( 1 + 3^2 + \cdots + 3^{99} \) is
   A). \( \frac{3^{100} - 1}{3-1} \); B). \( \frac{3^{99} - 1}{3-1} \); C). \( \frac{3^{101} - 1}{3-1} \); F). \( \frac{3^{101} - 1}{3-1} \) ( )

(c) Consider a population that grows according to a linear growth model. If the initial population is \( P_0 = 5 \), and the common difference is \( d = 2 \). What is \( P_{20} \)? ( )
   A). 45; B). 47; C). 50; D). 52

(d) Consider a population that grows according to a linear growth model. If \( P_0 = 6 \) and \( P_{10} = 26 \), what is the common difference \( d \)? ( )
   A). 1; B). 2; C). 3; D). 4
(e) \( \sqrt{a} + 1 \) is a solution of which of the quadratic equation? ( )
   A). \( x^2 - 2x + (1 - a^2) \); B). \( x^2 - 2x + (1 + a^2) \);
   C). \( x^2 + 2x + (1 - a^2) \); D). \( x^2 + 2x + (1 + a^2) \)

(f) Rotation clockwise by \( 90^\circ \) is equivalent to ( )
   A). Clockwise by \( 390^\circ \); B). Counterclockwise by \( 270^\circ \);
   C). Counterclockwise \( 540^\circ \); D). Counterclockwise by \( \pi/2 \)

(g) Find the value of \( x \) so that the shaded triangle is a gnomon to the white triangle \( ABC \). ( )
   A). 20; B). 25; C). 30; D). 40

(Please use the picture in the Textbook P384 for exercise 44).

(h) Find the value of \( c \) so that the shaded rectangle is a gnomon to the white rectangle with size 3 and 9. ( )
   A). 9; B). 18; C). 24; D). 27

(Please use the picture in the Textbook P383 for exercise 37).

4. Answer the following questions use the figure **on page 460 for exercise 23.** 9 pt

(a) Find the image of \( B \) under the reflection with the given axis?
(b) Find the image of \( B \) under a \( 90^\circ \) clockwise rotation with rotocenter \( A \).
(c) Find the image of the quadrilateral \( ABCD \) under the glide reflection specified by the vector \( v \) and axis \( l \)?

5. Deposit $100 in a saving account that pays 10% annual interest. 12 pt

(a) (2pts) In the plan \( A \), if the interest is compounded annually, how much money in the bank after **three** year? ( )
(b) (2pts) In the plan \( B \), if the interest is compounded quarterly (four times a year), how much money in the bank after **one** year? ( )
(c) What is the annual yield of the plan \( B \). ( )

6. 4 pt

(a) List all plane rigid motions which are proper. ( )
(b) List all plane rigid motions which are improper. ( )