1. **(4 points)** `Library/SDSU/Discrete/Predicates/negateB1.pg`
Consider the following statement:
Everyone likes playing games.
For the following questions,
Let $X = \{people\}$
$P(x)$ be the predicate x likes playing games.
Write the statement in quantified form

- A. $\forall x \in X, P(x)$
- B. $\forall x \in X, \sim P(x)$
- C. $\exists x \in X : P(x)$
- D. $\exists x \in X : \sim P(x)$

Negate the quantified statement

- A. $\forall x \in X, \sim P(x)$
- B. $\exists x \in X : \sim P(x)$
- C. $\forall x \in X, P(x)$
- D. $\exists x \in X : P(x)$

2. **(6 points)** `Library/SDSU/Discrete/Predicates/negateB2.pg`
Consider the following statement:
Some people are allergic to cats.
For the following questions,
Let $X = \{people\}$
$P(x)$ be the predicate x is allergic to cats.
Write the statement in quantified form

- A. $\exists x \in X : \sim P(x)$
- B. $\forall x \in X, \sim P(x)$
- C. $\forall x \in X, P(x)$
- D. $\exists x \in X : P(x)$

Negate the quantified statement

- A. $\forall x \in X, P(x)$
- B. $\exists x \in X, \sim P(x)$
- C. $\forall x \in X, \sim P(x)$
- D. $\exists x \in X : P(x)$

Translate the negated statement into English

- A. Nobody is allergic to cats
- B. There exists someone that is allergic to cats
- C. There exists someone that is not allergic to cats
- D. Everyone is allergic to cats

3. **(4 points)** `Library/SDSU/Discrete/Predicates/translateB1.pg`
Consider the following statement:
Nobody likes the smell of a skunk
For the following questions,
Let $X = \{people\}$
$P(x)$ be the predicate x likes the smell of a skunk.
Write the statement as an existential statement

- A. $\exists x \in X : \sim P(x)$
- B. $\forall x \in X, \sim P(x)$
- C. $\sim \exists x \in X : P(x)$
- D. $\exists x \in X : P(x)$

Write the statement as a universal statement

- A. $\forall x \in X, P(x)$
- B. $\sim \forall x \in X, \sim P(x)$
- C. $\forall x \in X, \sim P(x)$
- D. $\sim \exists x \in X : P(x)$

4. **(6 points)** `Library/SDSU/Discrete/Predicates/translateB2.pg`
Consider the following statement:
Not everyone is good at sports.
For the following questions,
Let $X = \{people\}$
$P(x)$ be the predicate x is good at sports.
Write the statement as a universal statement

- A. $\forall x \in X, \sim P(x)$
- B. $\forall x \in X, \sim P(x)$
- C. $\sim (\forall x \in X, P(x))$
- D. $\sim \exists x \in X : \sim P(x)$

Write the statement as an existential statement

- A. $\sim \exists x \in X : P(x)$
- B. $\exists x \in X : P(x)$
- C. $\sim (\exists x \in X : P(x))$
- D. $\exists x \in X : \sim P(x)$

Write the existential statement in English

- A. There does not exist someone who is good at sports
- B. There exists someone who is not good at sports
- C. There exists someone who is good at sports
- D. There does not exist someone who is not good at sports

5. **(5 points)** `Library/ASU-topics/setDiscrete/katie1.4_2.pg`

Let P(x) be the statement ”x is a duck”, let Q(x) be the statement ”x is one of my poultry”, let R(x) be the statement ”x is an officer”, and let S(x) be the statement ”x is willing to waltz”. Express each of the following statements in terms of P(x), Q(x), R(x) and S(x), quantifiers, and logical connectives. Let the universe of discourse consist of all living creatures. Put the appropriate letter next to the corresponding symbolic form.

___1. $\exists x(P(x) \wedge \neg S(x))$
___2. $\forall x(Q(x) \to P(x))$
___3. $\forall x(R(x) \to S(x))$
___4. $\forall x(Q(x) \to \neg R(x))$
___5. $\forall x(P(x) \to \neg S(x))$

a) Some ducks are not willing to waltz.
b) No ducks are willing to waltz.
c) No officers ever decline to waltz.

d) All my poultry are ducks.
e) My poultry are not officers.

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6. **(5 points)** `Library/ASU-topics/setDiscrete/katie6.pg`

Let $C(x)$ be the statement "x has a cat", let $D(x)$ be the statement "x has a dog" and let $F(x)$ be the statement "$x$has a ferret". Express each of the following statements in terms of $C(x)$, $D(x)$, and $F(x)$, quantifiers, and logical connectives. Let the universe of discourse consist of all students in your class. Put the appropriate letter next to the corresponding symbolic form.

___1. $\neg\exists x(C(x) \wedge D(x) \wedge F(x))$
___2. $\forall x(C(x) \vee D(x) \vee F(x))$
___3. $\exists x(C(x) \wedge D(x) \wedge F(x))$
___4. $\exists x(C(x)) \wedge (\exists x D(x)) \wedge (\exists x F(x))$
___5. $\exists x(C(x) \wedge F(x) \wedge \neg D(x))$

a) A student in your class has a cat, a dog, and a ferret.
b) All students in your class have a cat, a dog, or a ferret.
c) Some student in your class has a cat and a ferret but not a dog.
d) No student in this class has a cat, a dog, and a ferret.
e) For each of the three animals, cats, dogs, and ferrets, there is a student in your class who has one of these animals.

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7. **(2 points)** `Library/SDSU/Discrete/Predicates/predicateB7.pg`

Let $D = \{-1, 0, 1, 2, 3\}$ and consider the following statement:

$$\exists d \in D : d^2 - 4d + 4 = 0$$

Is this statement true?

- A. No, only some values of d satisfy the statement
- B. No, no values of d satisfy the statement
- C. Yes, all values of d satisfy the statement
- D. Yes, $d = 2$ satisfies the statement

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8. **(12 points)** `Library/Rochester/setDiscrete2Quantifiers/ur_dis_2_2.pg`

Determine the truth value of the following statements if the universe of discourse of each variable is the set of real numbers.

___1. $\forall x \exists y((x+y=2) \wedge (2x-y=1))$
___2. $\exists x(x^2 = -1)$
___3. $\exists x(x^2 = 2)$
___4. $\forall x \forall y \exists z(z = \frac{x+y}{2})$
___5. $\exists x \forall y \neq 0(xy = 1)$
___6. $\forall x \exists y(x^2 = y)$
___7. $\forall x \neq 0 \exists y(xy = 1)$
___8. $\forall x \exists y(x+y=1)$
___9. $\forall x \exists y(x = y^2)$
___10. $\exists x \exists y((x+2y=2) \wedge (2x+4y=5))$
___11. $\exists x \forall y(xy = 0)$
___12. $\exists x \exists y(x+y \neq y+x)$

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9. **(6 points)** `Library/ASU-topics/setDiscrete/katie1.pg`

Determine the truth value of the following statements if the universe of discourse is the set of real numbers.

___1. $\exists x(x^2+2>1)$
___2. $\exists x(x^2=-1)$
___3. $\exists x \forall y(xy=0)$
___4. $\exists x(x^2=2)$
___5. $\forall x(x^2 \neq x)$
___6. $\exists x(x^2 > x)$

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10. **(5 points)** `Library/NAU/setFoundations/MAT320_0202.pg`

Determine whether the given proposition is true or false, for the universe of all real numbers. Use T for true and F for false.

$$(\forall x)(\exists y)(x^2 + y = 0)$$

Answer: _____

$$(\exists x)(\forall y)(x^2 + y = 0)$$

Answer: _____

$$(\exists x)(\exists y)(x^2 + y = 0)$$

Answer: _____

$$(\forall y)(\exists x)(y = x^2)$$

Answer: _____

$$(\forall y)[y \geq 0 \implies (\exists x)(y = x^2)]$$

Answer: _____