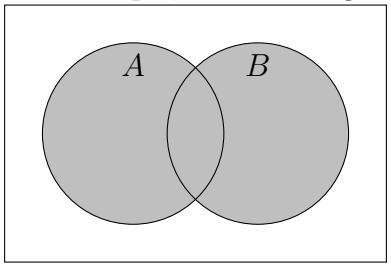
BECA / Dr. Huson / IB Math SL
8 February 2018
Take-home test: Probability & review topics
Open book, open notes, but no calculators or electronic aids. Name:

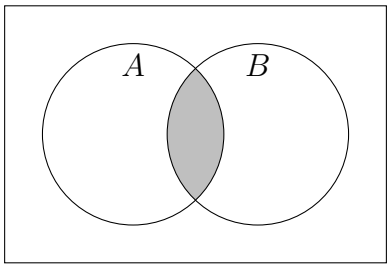
1. For each Venn diagram, write an expression representing the shaded area.

   (a) For example, for this diagram



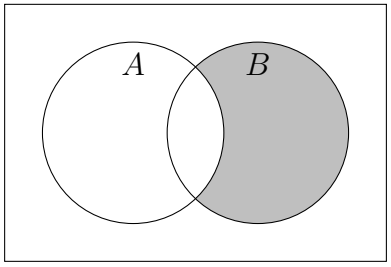
   Expression: $A \cup B$

   (b)



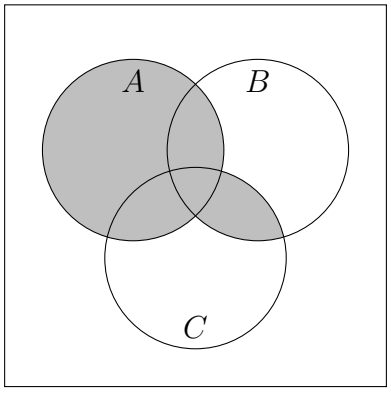
   Expression:

   (c)



   Expression:

   (d)



   Expression:

2. Using a calculator, find how many sets of three elements can be selected from a set of 10, when order does not matter, i.e. ${}_{20}\mathrm{C}_3$.

3. On May 5th, 20 horses will compete in the Kentucky Derby, "the most exciting two minutes in sports." Among the twenty horses, how many possible finishes of first, second, and third place are possible?

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4. Given:
   $A = \{a, b, c, d, e\}$ $B = \{a, e, i, o, u\}$

   (a) What is $A \cup B$?

   (b) What is $A \cap B$?

5. A survey question has three possible responses, A, B, and C. Among 100 surveys, the frequency of the answers collected were as follows: $n(A) = 40, n(B) = 35,$ and $n(C) = 25$.

   (a) If a survey is selected at random, what this the probability the response was B?

   (b) What is the probability a survey selected at random was an answer other than C?

6. The events A and B are independent with $\mathrm{P}(A) = 0.4$ and $\mathrm{P}(B) = 0.3$.

   (a) What is $\mathrm{P}(A \cap B)$?

   (b) What is $\mathrm{P}(A \cup B)$?

7. The events A and B are mutually exclusive with $\mathrm{P}(A) = 0.5$ and $\mathrm{P}(B) = 0.2$.

   (a) What is $\mathrm{P}(A \cap B)$?

   (b) What is $\mathrm{P}(A' \cup B)$?

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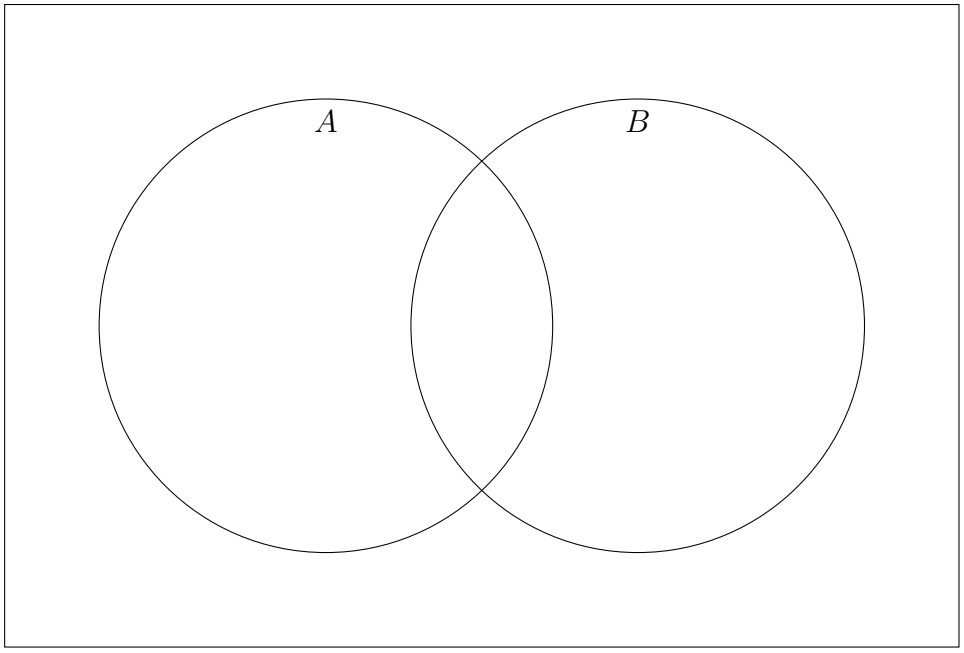
8. The universal set U is defined as the set of positive integers less than 13. The subsets A and B are defined as follows:
   $A = \{\text{integers that are multiples of 3}\}$
   $B = \{\text{prime numbers}\}$

   (note: Prime numbers have only themselves and one as factors. One is not considered a prime.)

   (a) List the members of A

   (b) List the members of B

   (c) Place the elements of A and B in the appropriate regions in the Venn diagram below.



   (d) List the items in the set $(A \cup B)'$

   (e) If an element is selected at random, what is the probability that it is a member of the set $A \cap B$?

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9. Let $f(x) = x^2 + x - 2$ and $g(x) = x + 2$

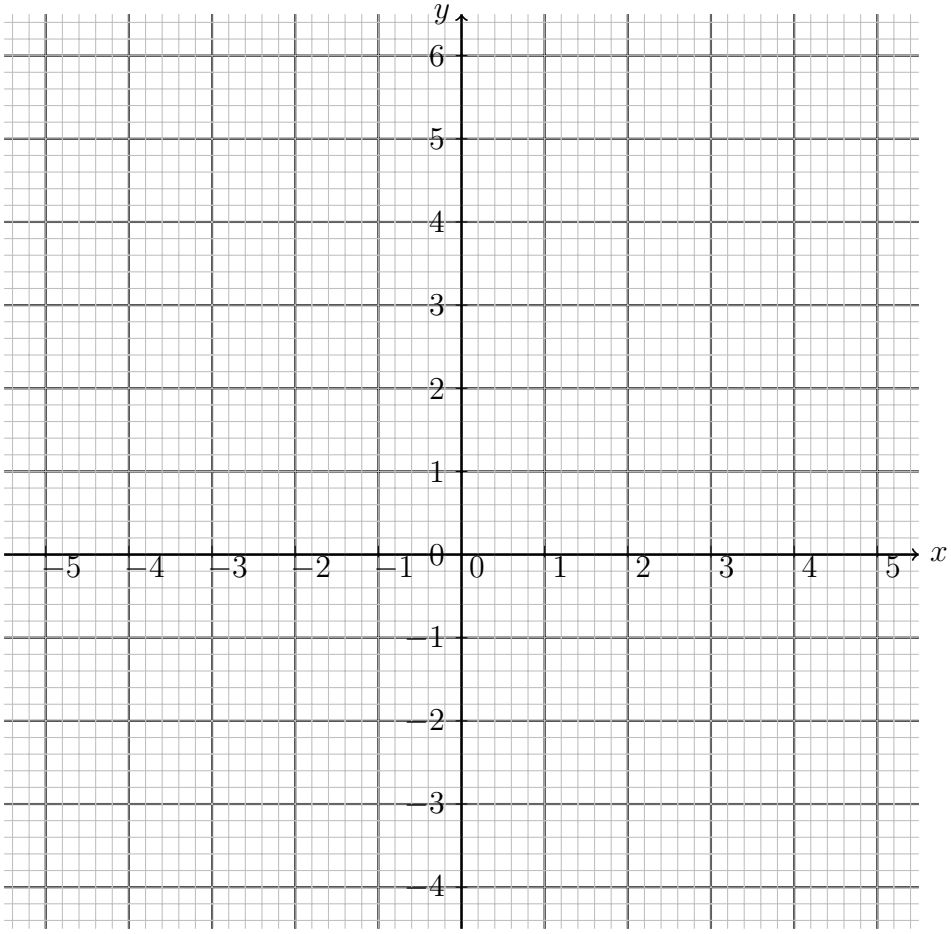
   (a) Rewrite f in vertex form and state the vertex as an ordered pair.

   (b) Factor the function f and write down its roots.

   (c) Graph the function f, labeling it. Mark the intercepts and graph the axis of symmetry as a dotted line, labeling it with its equation.

   (d) Graph g and label it with its name or equation.

   (e) Mark the intersections of f and g as ordered pairs.



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Simplify, leaving no negative or fractional exponents.

10. $2x^{-3}y \times \frac{1}{4}x^2y^{-1}$

11. $a^{\frac{3}{4}} \times (\frac{\sqrt{a}}{b^4})^{\frac{1}{2}}$

12. $\ln e^4$

13. $\log 5^2 + \log 4$

14. $(2x^2 - x - 5)(x - 3) - (x^2 + 3x - 5)(2x - 3)$

15. Factor the expression and then solve for x: $2x^3 - 2x^2 + 24x = 0$

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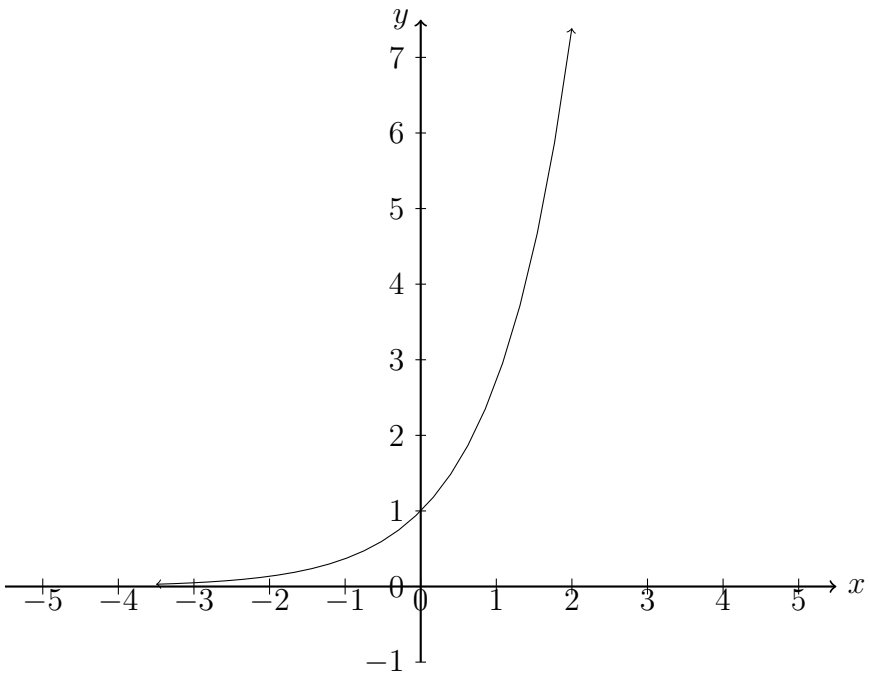
16. Let $f(x) = 2x - 5$ and $g(x) = (x-1)^2$

    (a) Find $(f \circ g)(x)$

    (b) Find $f^{-1}(x)$

17. The function $f(x) = e^x$ is shown on the graph. Sketch $g(x) = f(x-2) + 3$. Plot and label the asymptote(s).



Honor pledge

I have not received human help with this test, nor have I used calculator or online information. Signed: