

- 1) (3 points) At the magical restaurant Chipotle, you can select one of 5 different types of entrees, one of 5 different type of food item in that entrée, and one of 4 different types of salsa. What is the total number of meals possible?

$$5 \cdot 5 \cdot 4 = \boxed{100}$$

- 2) (3 points) Twelve people are in a room, three of which will be asked to serve on a committee. How many ways can these committees be formed?

$$C(12, 3) = \boxed{220}$$

- 3) (3 points each) A kennel has 24 cats available for adoption: 10 Siamese, 8 Russian Blue, and 6 Persian. Five cats will randomly selected to make sure they are lovable. (Sorry, I'm a dog person.) What is the probability (in fractional form) that...

a) All cats selected are Siamese?

b) Exactly 3 of them are Russian Blue?

$$\frac{C(10, 5)}{C(24, 5)} = \frac{252}{42504} = \boxed{\frac{3}{506}}$$

$$\frac{C(8, 3)C(16, 2)}{C(24, 5)} = \frac{56 \cdot 120}{42504} = \boxed{\frac{40}{253}}$$

- 4) (3 points) For problem 3, why could you **not** use a binomial probability to solve the question?



15
2

5) (4 points a - c; 3 points d) Suppose that it was previously found that 65% of Americans like to drink coffee when they wake up. Suppose 20 Americans were surveyed. Writing answers as percents rounded to four decimal places (e.g. 1.2345%), what is the probability that...

- a) All 20 drink coffee in the morning? b) Exactly 19 of them?

$$C(20, 20) (.65)^{20} (.35)^0 = \boxed{0.0182\%}$$

$$C(20, 19) (.65)^{19} (.35)^1 = \boxed{0.1952\%}$$

- c) At most 18 of them?

1 - (a) - (b) use the complement

$$= \boxed{99.7867\%}$$

- d) Of the 20 Americans, how many would you expect to drink coffee in the morning?

$$0.65 \cdot 20 = \boxed{13}$$

6) Silly Billy is baking...again. He made 12 cookies, 7 of which fell on the floor. His 3 friends walk by and each take a cookie. Let x be the number of cookies that fell on the ground.

- a) (4 points) Fill in the probability distribution table for this problem. Write answers as percents rounded to 1 decimal place. Make sure your percents add up to 100%:

x	0	1	2	3
$P(x)$	$\frac{C(7,0)C(5,2)}{C(12,3)}$ 4.5%	$\frac{C(7,1)C(5,2)}{C(12,3)}$ 31.8%	$\frac{C(7,2)C(5,1)}{C(12,3)}$ 47.7%	$\frac{C(7,3)C(5,0)}{C(12,3)}$ 15.9%

- b) (3 points) Find the expected number of cookies taken that happened to have fallen on the ground:

$$0 \cdot .045 + 1 \cdot .318 + 2 \cdot .477 + 3 \cdot .159 = \boxed{1.75 \text{ cookies}}$$

7) (3 points each) For the function $f(x) = 2x^2 - 4x + 1$, find and simplify...

- a) $f(7)$

$$= 2(7)^2 - 4(7) + 1 = \boxed{71}$$

- b) $f(x+h) = 2(x+h)^2 - 4(x+h) + 1$

$$= \boxed{2x^2 + 4xh + 2h^2 - 4x - 4h + 1}$$

8) (4 points each) For the quadratic function $f(x) = x^2 - 2x - 8$, find...

a) The vertex:

$$x = -\frac{(-2)}{2(1)} = 1$$

$$f(1) = 1^2 - 2(1) - 8 = -9$$

$$(1, -9)$$

c) The y-intercept:

$$f(0) = -8$$

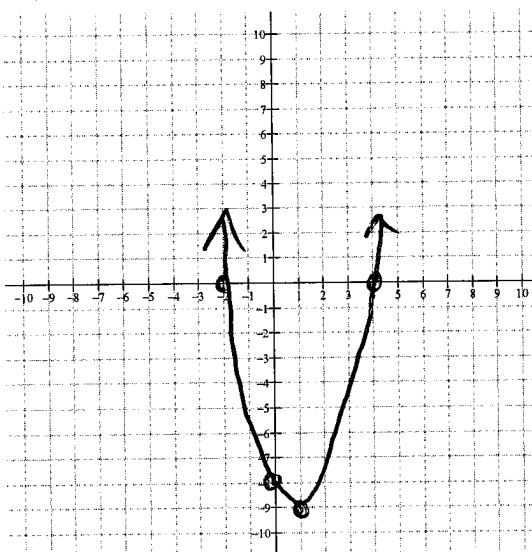
b) The x-intercepts:

$$x^2 - 2x - 8 = 0$$

$$(x-4)(x+2) = 0$$

$$x = 4, -2$$

d) Sketch the graph using the above:



9) (4 points each) For the rational function $f(x) = \frac{3x+3}{x^2-4x+4}$, find...

a) The domain:

$$x^2 - 4x + 4 = 0$$

$$(x-2)^2 = 0$$

$$x \neq 2$$

c) Any Vertical Asymptotes or Holes:

$$3(2) + 3 \neq 0$$

$$x = 2 \text{ VA}$$

b) Any intercepts (label your answers):

$$\begin{array}{l} \text{x-int} \\ 3x+3=0 \\ x=-1 \end{array}$$

$$\begin{array}{l} \text{y-int} \\ f(0) = \frac{3}{4} \end{array}$$

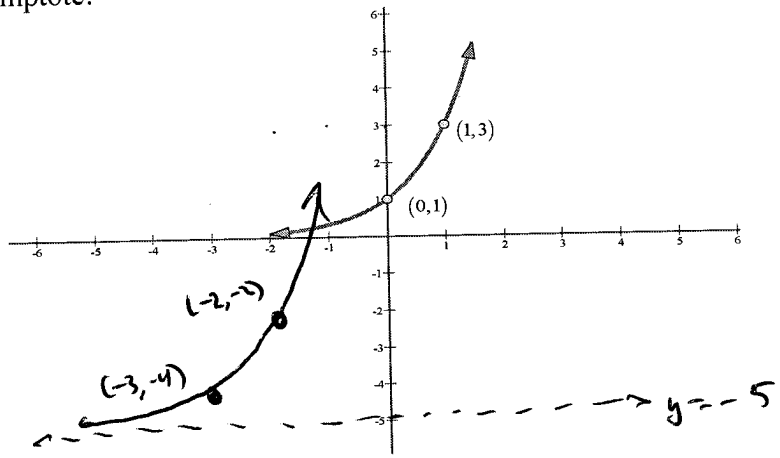
d) Any Horizontal Asymptotes:

$$y = 0$$

32

- 10) (4 points) Given the graph of $y = 3^x$ below, write the steps necessary to sketch the graph of $f(x) = 3^{x+3} - 5$ using transformations and then sketch the graph of the function. Be sure to label the transformed points and asymptote:

- 1) Left 3
2) Down 5



- 11) (4 points each) Find the exact value of the variable. Do not use decimals:

a) $3^{2x-7} = 243$

$$3^{2x-7} = 3^5$$

$$2x-7 = 5$$

$$x = 6$$

b) $5e^{3x+6} = 25$

$$e^{3x+6} = 5$$

$$\ln 5 = 3x+6 \Rightarrow x = \frac{\ln 5 - 6}{3}$$

c) $\ln(4x+7) = \ln(3x+12)$

$$4x+7 = 3x+12$$

$$x = 5$$

d) $\log_2(x-3) - \log_2(x+1) = 3$

$$\log_2\left(\frac{x-3}{x+1}\right) = 3$$

$$\frac{x-3}{x+1} = 2^3 = 8$$

$$x-3 = 8x+8$$

$$-11 = 7x$$

$$x = -\frac{11}{7} \quad \boxed{\emptyset}$$

- 12) (5 points) The half-life of a Big Mack is 6.8 years. Determine how much of a 12 oz sample is left after 10 years. Use the formula $y = y_0 e^{kt}$ by first solving for k . Write k as a decimal rounded to 4 decimal places:

$$6 = 12e^{k \cdot 6.8}$$

$$\frac{1}{2} = e^{6.8k}$$

$$k = \frac{\ln \frac{1}{2}}{6.8} \approx -0.1019$$

$$P(10) = 12e^{-0.1019 \cdot 10} \approx 4.3307$$

25