1) (2 points each) Determine if the following are functions. If not, suggest a change to make them into functions.

a) $y=2x+1$

yes!

b) $\{(2,5),(8,-1),(9,12),(10,-1),(2,6)\}$

No

$2 \to 5$

$\to 6$

change 2 to 7 for example.

2) (2 points each) Find the domain of the following functions:

a) $f(x)=3x^2-8x+1$

$\mathbb{R}$

b) $g(x)=\dfrac{7-5x}{x^2+6x-16}$

$x^2+6x-16=0$

$(x+8)(x-2)$

$x \neq -8, 2$

3) (6 points) For the function $f(x)=x^2+10x+4$, find and simplify $\dfrac{f(x+h)-f(x)}{h}$:

$$\frac{(x+h)^2+10(x+h)+4-(x^2+10x+4)}{h} = \frac{x^2+2xh+h^2+10x+10h+4-x^2-10x-4}{h}$$

$$= \frac{2xh+h^2+10h}{h} = \frac{h(2x+h+10)}{h}$$

$2x+h+10$

4) (2 pts part *a*, 3 pts part *b*) For the piecewise-defined function $f(x)=\begin{cases}2x+1 & x\le -1\\ -3x+5 & x\ge 3\end{cases}$

a) Evaluate the function:

i) $f(-10) = 2(-10)+1$

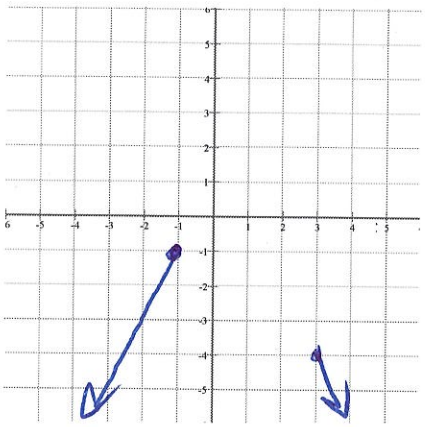
$= -19$

ii) $f(0)$ undefined!

iii) $f(3) = -3(3)+5 =$

$= -4$

b) Sketch a graph:



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5) (4 points each) With the announcement of the new Pixel phone, CwazyCases will start making custom cases for the phone and will sell them for $66.50 each. The cost to build each case is $24.50 and there is an additional cost of $2100 for tools and various supplies. Let x represent the number of cases made and sold.

a) Write and label the corresponding Revenue, Cost, and Profit functions for this problem:

$R(x) = 66.50x$

$C(x) = 24.50x + 2100$

$P(x) = 66.50x - (24.50x + 2100) = 42x - 2100$

b) When only 40 cases are sold, is there a profit or a loss? Show your work to support your answer.

$P(40) = -420$

loss of $420.

c) How many cases must be sold to break even?

$R(x) = C(x)$

$66.50x = 24.50x + 2100$

$42x = 2100$

$x = 50$ cases

6) (4 points each) It was found that the price and demand for a Cactar plushie can be given by $p = D(q) = 132 - 1.75q$ where p is price in dollars and q is the demand in hundreds of plushies.

Suppose that the price and supply (in hundreds of plushies) is given by $p = S(q) = 1.25q$.

a) Find and interpret, using the language of the problem, the following.

i) $D(60) = 132 - 1.75(60)$

$p = 27$

If the price is $27, 6000 plushies are demanded.

ii) $S(26) = 1.25(26)$

$p = 32.5$

If the price is $32.50, 2600 plushies are supplied.

b) Find and interpret the intercepts of the Demand function:

$q = 0 \quad p = 132 - 1.75(0) = 132$

$p = 0 \quad 0 = 132 - 1.75q \Rightarrow q \approx 75$

Zero are demanded when the price is $132

7500 are demanded when the price is $0.

c) Find and interpret the intercept of the Supply function:

$q = 0 \rightarrow p = 0$

No plushies are supplied when the price is zero dollars.

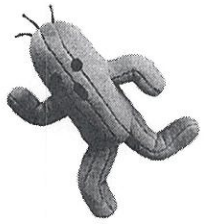
d) Find the equilibrium quantity and equilibrium price:

$D(q) = S(q)$

$132 - 1.75q = 1.25q$

$132 = 3q \Rightarrow q = 44$

$p = 1.25(44) = 55$



7) (1 points each) Short answer: In your own words, describe the formula for the:…

a) Cost Function:

b) Revenue Function:

c) Profit Function:

Words

35

8) (1 point each) Explain the following terms:

a) Break even

b) Equilibrium quantity and value

9) (3 points each) Jo Jo Ba decided to drop the javelin and start launching pumpkins that she found on her neighbors' front porch. Throwing the pumpkins from a 50-foot cliff, the height of the pumpkin h, in feet, can be given by the function $h(t) = -16t^2 + 73.6t + 50$ where t is time in seconds. Determine the following, rounding to two places as needed.

a) At what time is the pumpkin the highest off of the ground?

$t = -\frac{b}{2a} = \frac{-73.6}{2(-16)}$

$= 2.3$ sec

b) What is the highest height the pumpkin reaches?

$h(2.3) =$

134.64 ft

c) When does the pumpkin hit the ground?

$-16t^2 + 73.6t + 50 = 0$

$t = \frac{-73.6 \pm \sqrt{73.6^2 - 4(-16)(50)}}{2(-16)}$

$t = 5.2$ or $t = -0.6$

d) What is the domain of this function?
Hint: Remember that t represents time.

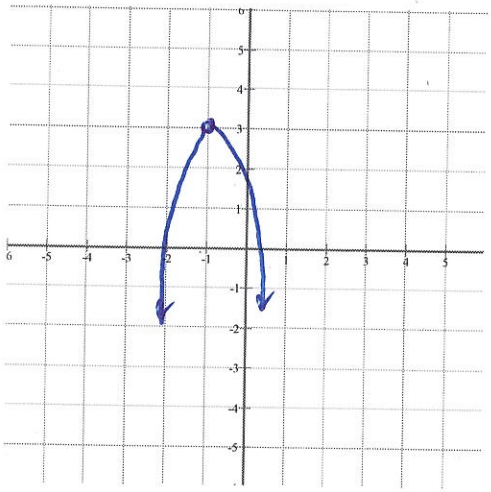
$[0, 5.2]$

10) (3 points each) For the function $f(x) = \cancel{-2|x+1|+3}$... $-2(x+1)^2+3$

a) List the transformations needed to sketch a graph:

1. Left 1
2. multiply y coor by -2
3. up3

b) Sketch a graph.



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11) (4 points each) For the function $f(x)=(x+2)^3(x-4)^2$

a) Find the leading term and state which quadrants the arrowheads will be in and why:

$x^5 \to$ odd

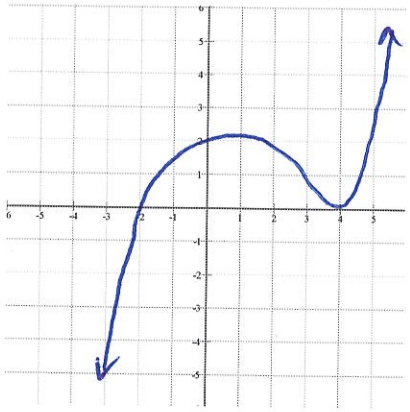
positive

Q I & III

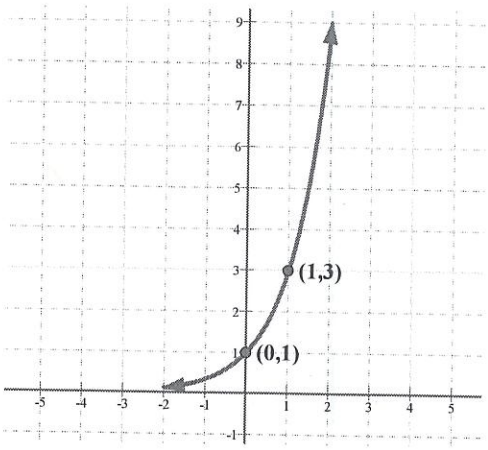
b) Fill in the chart:

Zero	Multiplicity	Touch/Cross
-2	3	cross
4	2	touch

c) Sketch the graph based on parts *a* and *b*:

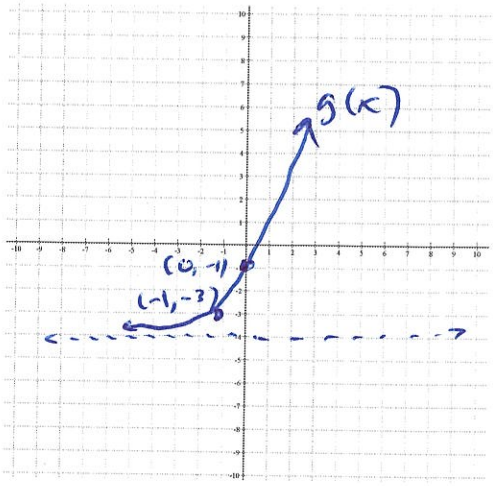


12) (4 points) Graph $g(x)=3^{x+1}-4$ by transforming the given function $y=3^x$. Be sure to move and label the given points and asymptotes.



left 1

down 4



13) (3 points each) The number of irate Dutch people in the Netherlands was growing exponentially after someone ate a stroopwafel without properly heating it. The number of Dutch can be modeled by the function $d(x)=2.14e^{0.44x}$ where x is the number of days after the stroopwafel was improperly ingested and d is the number of Dutch in thousands. Round to the nearest whole number as needed.

a) Approximately how many Dutch were upset after the first week?

$d(7) \approx 46,563$ Dutch people

b) How many became irate on the 9th day?

$D(9)-D(8) \approx 39,900$ Dutch people

c) Using the INTERSECT command on your calculator, during which day will there be 4,000 irate Dutch people?

$y=4$.

$x=1.42$

During Day 2.

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