1) Multiply: $(x^2 - 3x + 4)(2x - 3)$

$$x^2 - 3x + 4$$
$$2x - 3$$
$$-3x^2 + 9x - 12$$
$$-6x^2 + 8x$$

$$2x^3 - 9x^2 + 17x - 12$$

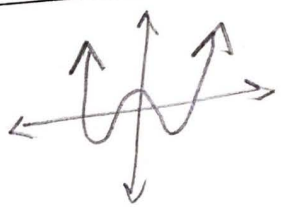
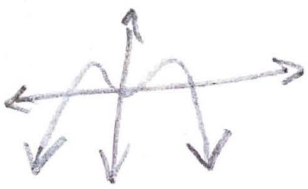
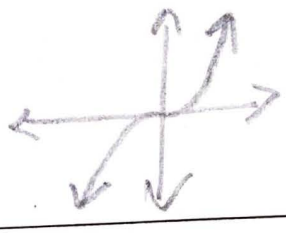
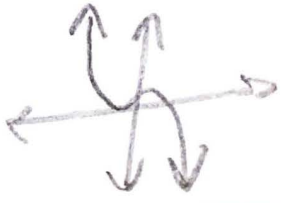
2) Divide: $(x^4 + 0x^3 + 0x^2 + 3x + 9) \div (x + 6)$

$$\begin{array}{r|rrrrr} -6 & 1 & 6 & 0 & 3 & 27 & 64 \\ & \downarrow & -6 & 0 & 0 & -18 & -54 \\ \hline & 1x^4 & 0x^3 & 0x^2 & 3x & 9 & r\,10 \end{array}$$

$$= x^4 + 3x + 9 \quad r\ 10$$

$$= x^4 + 3x + 9 + \frac{10}{x+6}$$

3) Fill in the table below.

End Behavior	Positive or Negative Leading Coefficient	Even or Odd Degree	Sketch a graph that could have this end behavior
as $x \to +\infty, f(x) \to +\infty$ as $x \to -\infty, f(x) \to +\infty$	+	E	
as $x \to +\infty, f(x) \to -\infty$ as $x \to -\infty, f(x) \to -\infty$	−	E	
as $x \to +\infty, f(x) \to +\infty$ as $x \to -\infty, f(x) \to -\infty$	+	O	
as $x \to +\infty, f(x) \to -\infty$ as $x \to -\infty, f(x) \to +\infty$	−	O	

Find $f(-3)$; $f(x) = 4x^3 - 5x^2 + 6x - 1$

	4	-5	6	-1
-3	↓	-12	51	-171
	4	-17	57	-172

$f(-3) = -172$

$4(-3)^3 - 5(-3)^2 + 6(-3) - 1$

5) $f(x) = (x-2)(x+1)(x-3)$

x-intercept(s): $x-2=0$ $x=2$ $x+1=0$ $x=-1$ $x-3=0$ $x=3$

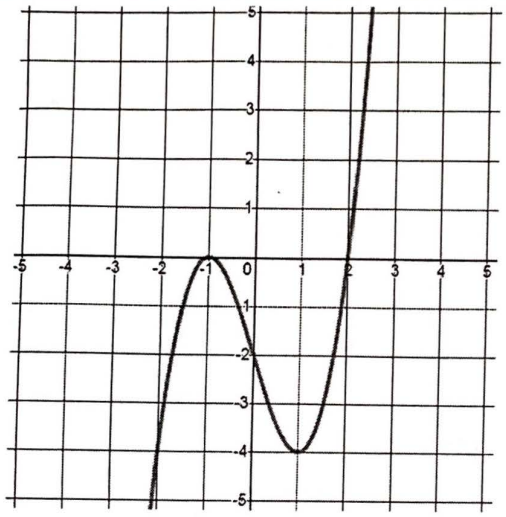
(2,0) (-1,0) (3,0)

y-intercept: (0,6)

$y = (0-2)(0+1)(0-3)$

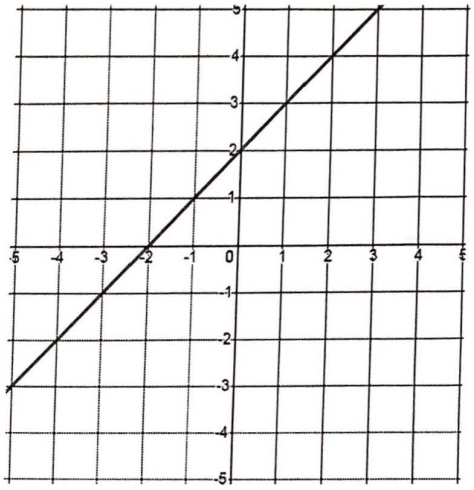
$(-2)(1)(-3) = 6$

6) Classify each of the graphs below by type of graph. Then, write each in factored form.



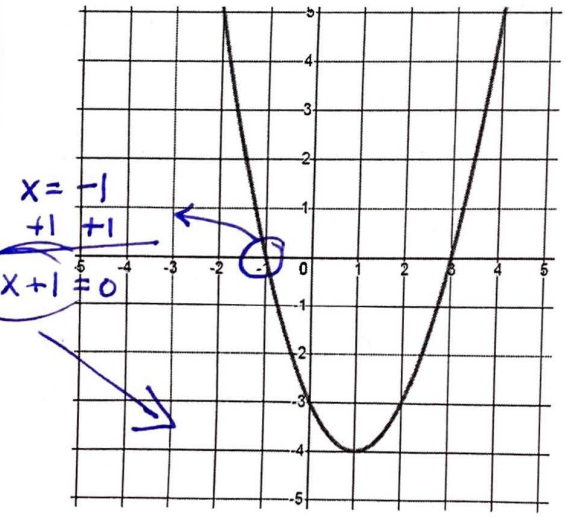
Type of Graph: Odd, + L.C. cubic

Factored Form: $f(x) = 1(x+1)^2(x-2)$



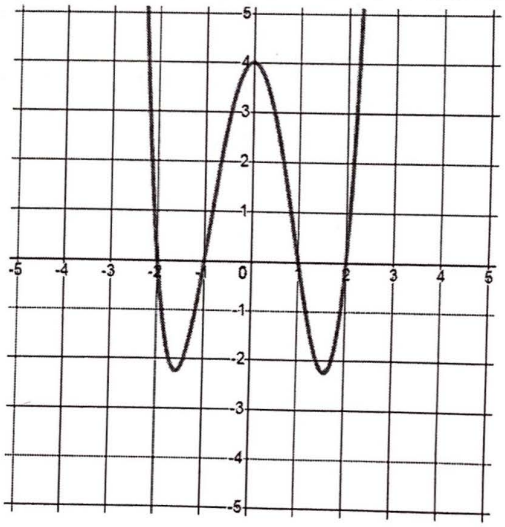
Type of Graph: linear, + slope

Factored Form: $y = 1x + 2$



Type of Graph: Quadratic even, + L.C.

Factored Form: $f(x) = 1(x+1)(x-3)$



Type of Graph: Quartic even, + L.C.

Factored Form: $f(x) = 1(x+2)(x+1)(x-1)$

7) Factor and solve: $x^4 - 81 = 0$

Difference of squares:

$(x^2-9)(x^2+9)=0$

Diff. of squares

$(x+3)(x-3)(x^2+9)=0$

$x+3=0$ $\quad x-3=0$ $\quad \sqrt{x^2}=\sqrt{-9}$

$-3\ -3$ $\quad +3\ +3$ $\quad x=\pm 3i$

$x=-3$ $\quad x=+3$

8) Factor and solve: $x^2 - 25 = 0$

$x^2-25=0$

$+25\ +25$

$\sqrt{x^2}=\sqrt{25}$

$x=\pm 5$

$x^2-25=0$ Difference of squares

$(x+5)(x-5)=0$

9) Factor and solve: $x^4 - 2x^2 - 15 = 0$

$(x^2-5)(x^2+3)=0$

$x^2-5=0$ $\quad x^2+3=0$

$+5\ +5$ $\quad -3\ -3$

$\sqrt{x^2}=\sqrt{5}$ $\quad \sqrt{x^2}=\sqrt{-3}$

$x=\pm\sqrt{5}$ $\quad x=\pm i\sqrt{3}$

10) Factor and solve: $x^3 - 5x^2 + 3x - 15 = 0$

$(x^3-5x^2)+(3x-15)=0$

$x^2(x-5)+3(x-5)=0$

factoring by grouping

$(x^2+3)(x-5)=0$

$x-5=0$

$+5\ +5$

$x=5$

$x^2+3=0$

$-3\ -3$

$x^2=-3 \Rightarrow x=\pm i\sqrt{3}$

TRIGONOMETRIC FUNCTIONS

1) $f(x) = 3\sin(2x) - 4$

$2x=0 \Rightarrow x=0$

$2x=2\pi \Rightarrow x=\pi$

Transformations:

- Down 4; midline $y=-4$
- Up/down 3; amplitude 3
- Condensed; period starts at 0, ends at π

Domain: $(-\infty, +\infty)$

Range: $[-7, -1]$

Period: $0 \to \pi$ period: π

2) $f(x) = -5\cos\left(\frac{x}{3}\right) + 1$

$\frac{x}{3}=0$ $\quad x=0$

$\frac{x}{3}=2\pi$ $\quad x=6\pi$

Transformations:

- up 1; midline $y=1$
- flip (inverted)
- Up/down 5 (amplitude)
- Stretched (period starts at 0, ends at 6π)

Domain: $(-\infty, +\infty)$

Range: $[-4, 6]$

Period: $0 \to 6\pi$ period: 6π

Convert the following degrees to radians.

a) $270°$ $\frac{3}{270^{\circ}} \cdot \frac{\pi}{180^{\circ}_{2}} = \frac{3\pi}{2}$

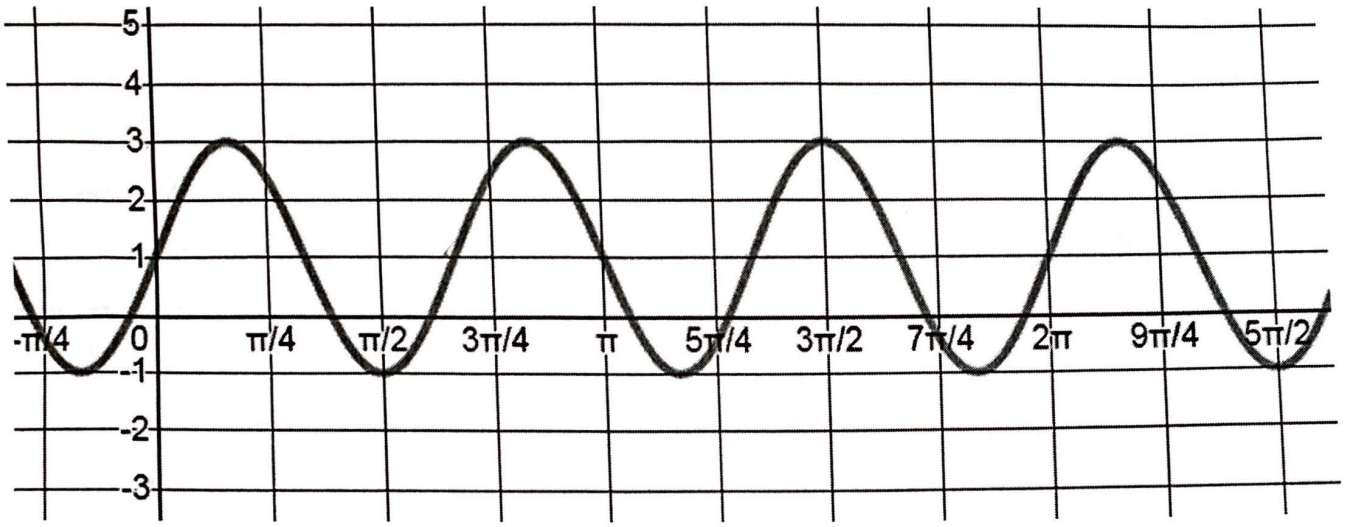
b) $255°$ $\frac{17}{255^{\circ}} \cdot \frac{\pi}{180^{\circ}_{12}} = \frac{17\pi}{12}$

4) Convert the following radians to degrees.

a) $\frac{\pi}{4}$ $\frac{\pi}{4} \cdot \frac{180^{\circ}}{\pi} = 45°$

b) $\frac{5\pi}{8}$ $\frac{5\pi}{8} \cdot \frac{180^{\circ}}{\pi} = 112.5°$

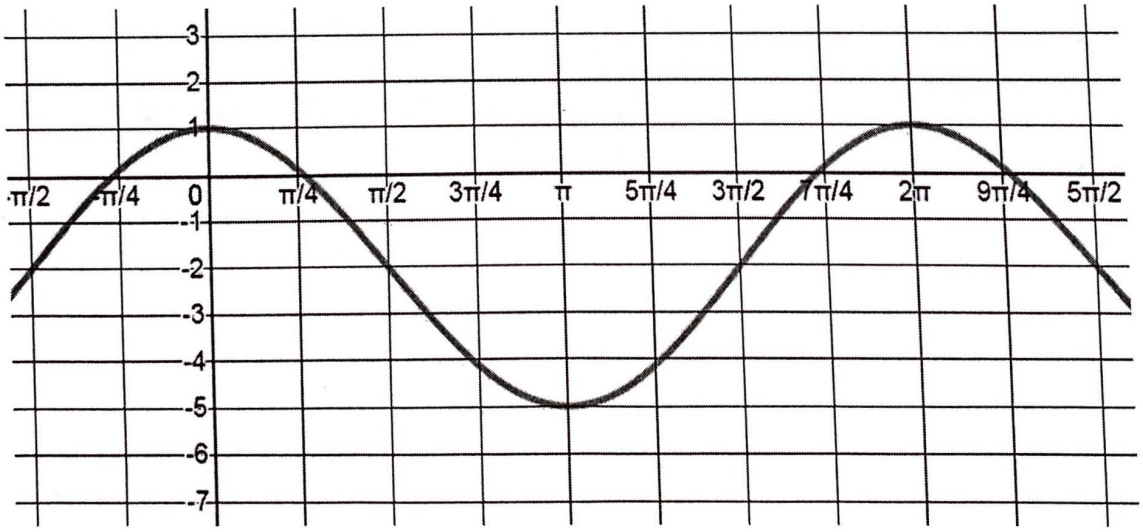
5) Write an equation for the graph.



Sin or Cos? Sin Amplitude: 2 Midline: $y = 1$

How many waves are inside of 2π? 3 Equation: $f(x) = 2\sin(3x) + 1$

6) Write an equation for the graph.



Sin or Cos? Cos Amplitude: 3 Midline: $y = -2$

How many waves are inside of 2π? 1 Equation: $f(x) = 3\cos(1x) - 2$

a) $\sin\frac{5\pi}{6}$ 1/2 b) $\cos\frac{3\pi}{2}$ 0 c) $\sin\frac{5\pi}{3}$ $-\frac{\sqrt{3}}{2}$ d) $\cos\frac{\pi}{4}$ $\frac{\sqrt{2}}{2}$

8) If $\sin\theta = \frac{12}{13}$ and is in quadrant 1. Find $\cos\theta$ + and $\tan\theta$ +.

$\sin^2\theta + \cos^2\theta = 1$

$\left(\frac{12}{13}\right)^2 + \cos^2\theta = 1$

$\cos^2\theta = 1 - \frac{144}{169}$

$\cos^2\theta = \frac{169-144}{169}$

$\cos^2\theta = \frac{25}{169}$

$\cos\theta = 5/13$

$\tan\theta = \frac{\sin\theta}{\cos\theta} = \frac{\frac{12}{13}}{\frac{5}{13}}$

$\frac{12}{13}\cdot\frac{13}{5} = \frac{12}{5}$

9) If $\cos\theta = -\frac{3}{7}$ and is in quadrant 2. Find $\sin\theta$ + and $\tan\theta$ −.

$\left(-\frac{3}{7}\right)^2 + \sin^2\theta = 1$

$\frac{9}{49} + \sin^2\theta = 1$

$\sin^2\theta = \frac{49-9}{49}$

$\sin^2\theta = \frac{40}{49}$

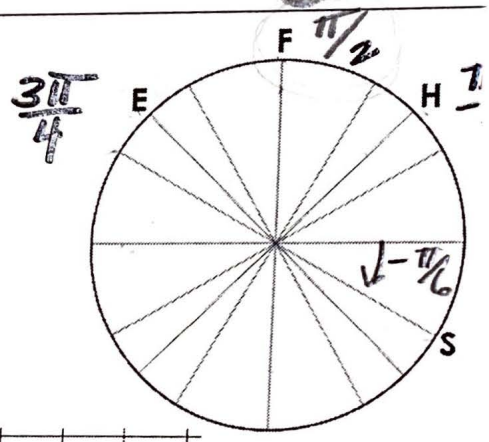
40 = 4 · 10 = (2·2)(2·5)

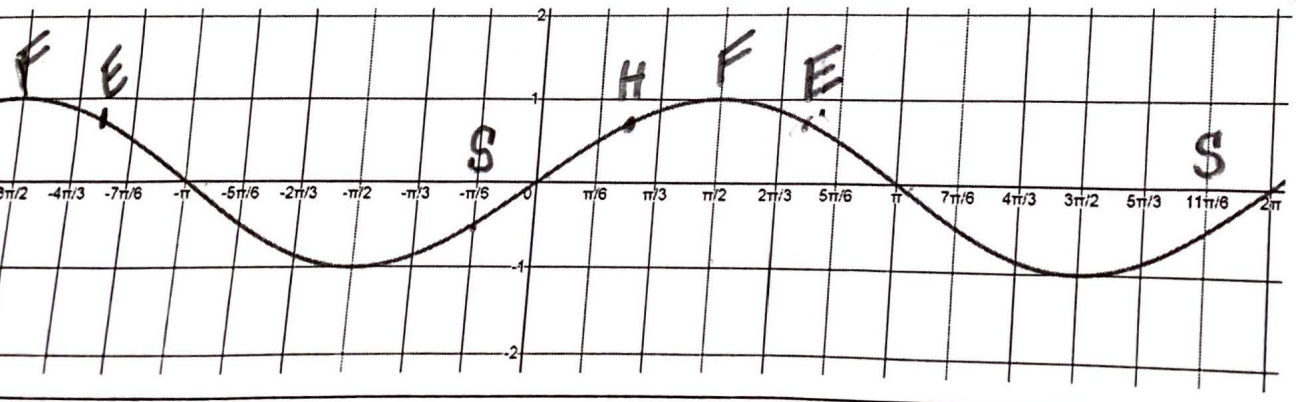
$\sin\theta = \frac{2\sqrt{10}}{7}$

$\tan\theta = \frac{\frac{2\sqrt{10}}{7}}{-\frac{3}{7}}$

$\frac{2\sqrt{10}}{7}\cdot\frac{7}{-3} = -\frac{2\sqrt{10}}{3}$

10) Plot the points from the circle onto the graph.





PROBABILITY AND STATISTICS

1) Use the table to find the probabilities below. Give both reduced fractions and percentages.

Eye Color	Black	Brown	Blue	Green	Gray	Total
Female	20	30	10	15	10	85
Male	25	15	12	20	10	82
Total	45	45	22	35	20	167

a) P(Brown)= $\frac{45}{167}$

b) P(Male and Green)= $\frac{20}{167}$

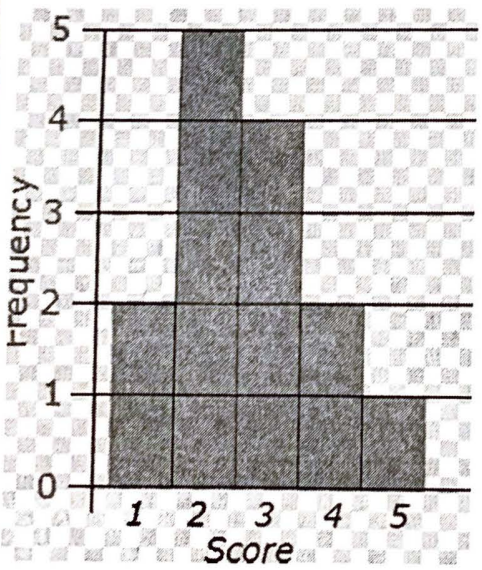
c) P(Female or Blue)= $\frac{85 + 22 - 10}{167} = \frac{97}{167}$

d) P(Gray | Male)= $\frac{10}{82}$

e) P(Blue or Green)= $\frac{22+35}{167}$ $\frac{57}{167}$

f) P(Female and Gray)= $\frac{10}{167}$

2) Use the histogram below to find the mean, median, mode, and range.



Mean: $\frac{1(2) + 2(5) + 3(4) + 4(2) + 5(1)}{14}$

$\frac{37}{14} = 2.64286$

Median: $14 \div 2 = 7 + 0.5 = 7.5$

3

Mode: 2

Range: $5 - 1 = 4$

Put them in order from least to greatest:

Mode, Mean, Median, Range

Use the table below to find the mean, median, mode, and range.

# of Tacos Eaten	Frequency
2	17
4	23
6	16
8	24

Mean:

$$\frac{2(17)+4(23)+6(16)+8(24)}{80}$$

$$\frac{414}{80} = 5.175$$

Median: $80 \div 2 = 40 + 0.5$

6

Mode: 8

Range: $8 - 2 = 6$

Put them in order from least to greatest:

Mean, Median/Range, Mode

4) The weights of dogs in a doggy day care are listed below. If the 85 pound dog loses weight and now weighs 80 pounds, how does the mean and median change?

Weights: 20, 25, 34, 35, 36, 42, 56, 58, 60, 62, 70, ~~85~~ 80

Original Mean:

48.5833

New Mean:

48.1667

Original Median:

49

New Median:

49

5) Yasmine has a bag of marbles with 4 red, 8 yellow, 2 green, and 6 purple.

a) What is the probability that she pulls out two yellows given that she places the first marble back before grabbing the second?

$$\frac{8}{20} \cdot \frac{8}{20} = \frac{64}{400} = 16\%$$

b) What is the probability that she gets a green, does not replace it, and then gets a red?

$$\frac{2}{20} \cdot \frac{4}{19} = \frac{8}{380} \approx 2.1\%$$

EXPONENTIAL AND LOGARITHMIC FUNCTIONS

1) Make up a story problem that could model the equation: $f(t) = 1{,}000(0.85)^t$

John's $1000 investment loses 15% each year. How much money will he have in 6 years?

2) Solve: $\frac{3^x}{3^x} = 3^{-5x}$

$1 = 3^{-5x}$

$\log_3 1 = \log_3 3^{-5x}$

$0 = -5x$

$0 = x$

4) Find the equation of the asymptote for the functions below.

a) $f(x) = \log_4(x-3) + 2$ $x = 3$

b) $f(x) = \log_5(x-7) - 1$ $x = 7$

c) $f(x) = 3^x - 2$ $y = -2$

d) $f(x) = 5(2)^x + 8$ $y = 8$

5) Solve: $5^{5-4x} = 125$

$\log_5 5^{5-4x} = \log_5 125$

$5 - 4x = 3$

$-5 \quad -5$

$\frac{-4x}{-4} = \frac{-2}{-4}$

$x = 1/2$

6) Solve: $5^{2x-3} = 1$

$\log_5 5^{2x-3} = \log_5 1$

$2x - 3 = 0$

$2x = 3$

$x = 3/2$

7) Solve: $4^x \cdot 4^{6x} = 4^{2x}$

$4^{7x} = 4^{2x}$

$7x = 2x$

$x = 0$