1. $(x+3)^3 - 9x(x+3)$

$(x+3)(x+3)(x+3) - 9x(x+3)$

$(x^2+6x+9)(x+3) \quad -9x^2-27x$

$x^3+6x^2+9x+3x^2+18x+27 \quad -9x^2-27x$

$x^3+9x^2+27x+27-9x^2-27x$

x^3+27

2. $x^3-2x^2+13x+k$, remainder is -8 when divided by $x+1$

-1 | $1 \quad -2 \quad 13 \quad k$

$\quad\quad -1 \quad 3 \quad -16$

$1 \quad -3 \quad 16 \quad -8$

$k+-16=-8$

$+16 \quad +16$

$k=8$

$(x^3-2x^2+13x+8) \div (x-1)$

1 | $1 \quad -2 \quad 13 \quad 8$

$\quad\quad 1 \quad -1 \quad 12$

$1 \quad -1 \quad 12 \quad 20$

remainder is 20

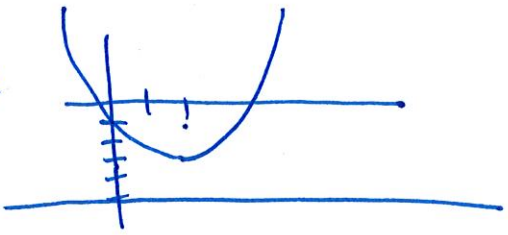
4. Use Calc and use zoomfit, intersect

Intersect #1 28.34 #2 60.49

2013 + 28.34 2013 + 60.49

2042 2073

5. directrix $y=-5$, focus $(2,-1)$

Looks like 

Vertex half way between, focus inside, never touch directrix

Vertex x-coordinate = 2 (from focus coordinate)

$$y\text{-coordinate} = \frac{-1+-5}{2} = \frac{-6}{2} = -3$$

$(2,-3)$

~~$\frac{1}{4c}(x-2)^2+3$~~

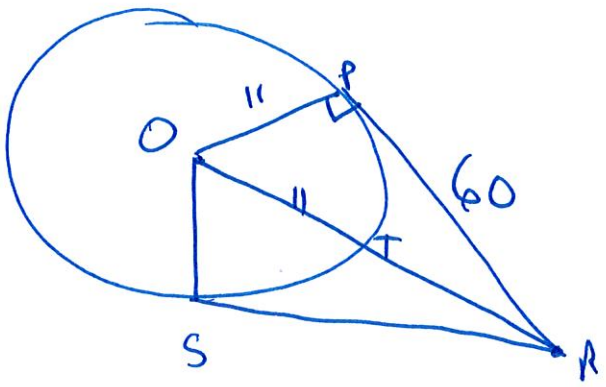
$\frac{1}{4c}(x-2)^2-3$

c = # of spaces from vertex of the focus.

$c=2$

$\frac{1}{8}(x-2)^2-3$

6.



OT is a radius, so is OP.

$OP = 11$

Radius drawn to tangent makes 90° angle.

Use Pythagorean Theorem

$$11^2 + 60^2 = OR^2$$

$$121 + 3600 = OR^2$$

$$3721 = OR^2$$

$$61 = OR$$

7. Big sector − Little sector = outer edge

Sector formula $\frac{d}{360} \cdot \pi r^2$

$$\frac{30}{360} \cdot \pi \cdot 6^2 - \frac{30}{360} \cdot \pi \cdot 2^2 \approx 8.3775$$

8. $8x^2 + 3x = -7$

$8x^2 + 3x + 7 = 0$

$$\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$\frac{-3 \pm \sqrt{3^2 - 4 \cdot 8 \cdot 7}}{2 \cdot 8}$$

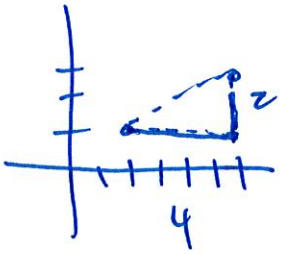
$$\frac{-3 \pm \sqrt{-215}}{16} = \frac{-3 \pm i\sqrt{215}}{16}$$

9. Use calc to find pts of intersection.

Abs is under "math" key, so [Y=] [math] [enter] #1

point #1 (2,1) point 2 (6,3)

use distance formula or pythagorean theorem on graph paper



$2^2 + 4^2 = d^2$

$4 + 16 = d^2$

$20 = d^2$

$\sqrt{20} = d$

$d = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$

$d = \sqrt{(2-6)^2 + (1-3)^2}$

$\sqrt{(-4)^2 + (-2)^2}$

$\sqrt{16 + 4}$

$d = \sqrt{20}$

10. Must find cost of gas by taking # of "fill-ups" times price = cost

$$\frac{15000}{20} \cdot 3.25 = \$2437.50$$

subtract savings of $650

$$2437.50 - 650 = 1787.50$$

$$\frac{\text{miles}}{\text{mpg}} \cdot \text{price} = \text{cost}$$

$$\frac{15000}{x} \cdot 3.25 = 1787.50$$

$$\frac{48750}{x} = \frac{1787.50}{1}$$

make a proportion and solve

$$48750 = 1787.50x$$

$$27.27 = x$$

$$\text{or} \approx 27.3$$

How many more mpg is

$$27.3 - 20 = 7.3$$

11. Survey because you are seeking opinion ~~versus~~ instead of an outcome of some behavior or treatment.

12. A is correct because it uses a list of all students and not just those who use the cafeteria

13. $x^2+10x-8=(x-h)^2-33$

$+33 \qquad +33$

$x^2+10x+25=(x-h)^2$

$(x+5)(x+5)=(x-h)^2$

$(x+5)^2=(x-h)^2$

$h=-5$

14. 2 layers of 12. Can test multiple arrangements, but this is best.

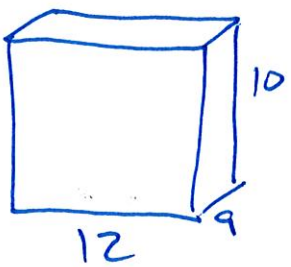
9

OOO
OOO
OOO
OOO

12

diameter = 3

2 layers, 5 inches tall each



Front & back $120+120=240$

Left & right $90+90=180$

Top & bottom $108+108=216$

Add all side = 636

15. $\frac{\cos\theta}{1-\sin\theta} - \tan\theta$ When stuck, define $\tan\theta$ as $\frac{\sin\theta}{\cos\theta}$

$\frac{\cos\theta}{1-\sin\theta} - \frac{\sin\theta}{\cos\theta}$ Get common denominator

$\frac{\cos\theta\cdot\cos\theta}{\cos\theta(1-\sin\theta)} - \frac{\sin\theta(1-\sin\theta)}{\cos\theta(1-\sin\theta)}$

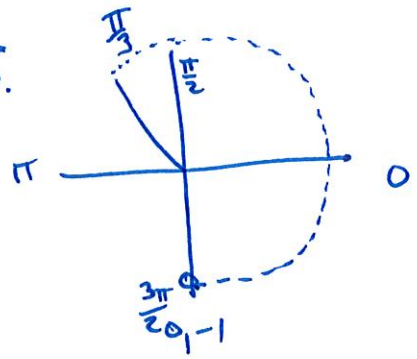
$\frac{\cos^2\theta - \sin\theta + \sin^2\theta}{\cos\theta(1-\sin\theta)}$

$\frac{\sin^2\theta+\cos^2\theta-\sin\theta}{\cos\theta(1-\sin\theta)}$ Hint: $\sin^2\theta+\cos^2\theta=1$

$\frac{1-\sin\theta}{\cos\theta(1-\sin\theta)}$

$\frac{1}{\cos\theta}$ ← Definition of $\sec\theta$

16.



Remember $\frac{1}{2}$ circle $= \pi$

And The axes are labeled $0, \frac{\pi}{2}, \pi, \frac{3\pi}{2}$

$\frac{4\pi}{3}$ is $\frac{3\pi}{3} + \frac{1\pi}{3}$ or $\pi + \frac{1\pi}{3}$. π is a half Circle and Then $\frac{\pi}{3}$ more.

Angle is $\frac{\pi}{2} + \frac{\pi}{3} = \frac{3\pi}{6} + \frac{2\pi}{6} = \frac{5\pi}{6}$

17. normalcdf (2.99, 4.01, 3.67, 0.34) = .8186

$.8186 \cdot 685 \approx 560.741$

18. $y = x^3$

$y = (x-h)^3 + k$ h moves left/right opposite the sign

k moves up/down same as sign

2 down, right 3

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

19. $f(x) = 1.5^x + 4$

$y = 1.5^x + 4$ Switch x & y, solve for y

$x = 1.5^y + 4$

$-4 \quad -4$

$x - 4 = 1.5^y$ Get y from exponent by using log.

$y = \log_{1.5} x - 4$

$y = \dfrac{\log x - 4}{\log 1.5}$ Change of base rule $\log_a b = \dfrac{\log b}{\log a}$

$f^{-1}(x) = \dfrac{\log x - 4}{\log 1.5}$

20. D. $\angle NLM \cong \angle QOP$ gives $\cong$ corresponding parts.

A and B would have a different ratio from $\frac{12}{8}$ on the given sides

C gives angles that are not in corresponding position

21. Similar means measurements in proportion

Check using cross products

A. $\frac{9}{12} = \frac{6}{9}$ $72 \neq 81$

B. $\frac{6}{8} = \frac{2}{4}$ $24 \neq 16$

C. $\frac{5}{4} = \frac{4}{5}$ $25 \neq 16$

D. $\frac{6}{8} = \frac{3}{4}$ $24 = 24$

22. Use calc

$$S_n = \frac{a_1(1-r^n)}{1-r}$$

$$\frac{8(1-(\frac{-1}{7})^{2500})}{(1-\frac{-1}{7})} \approx \frac{8(1-0)}{\frac{8}{7}} = \frac{8(1)}{\frac{8}{7}}$$

$$8 \div \frac{8}{7} = 7$$

23.

Volume: $L \cdot W \cdot H$

$\frac{V}{L} = W \cdot H$

$$\frac{x^3 - 2x^2 - 20x - 24}{x-6} = x^2 + 4x + 4$$

$$= (x+2)(x+2)$$

6 | 1 -2 -20 -24

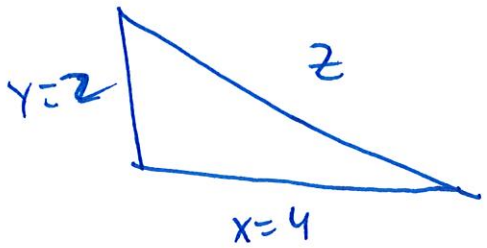
6 24 24

1 4 4 0

Since height and width are equal, This makes sense.

$w = x+2$

24



irrational: never ending, non repeating decimal

$z^2 + 4^2 = z^2$

$4 + 16$

$20 = z^2$

$\sqrt{20} = z$

$\sqrt{20} = 4.4721...$

So $x + y + z$ would be irrational

25. $(4-3i)^2 + (6+i)^2$

$(4-3i)(4-3i) + (6+i)(6+i)$

$16 - 12i - 12i + 9i^2 + 36 + 6i + 6i + i^2$

$16 - 24i - 9 + 36 + 12i - 1$

$42 - 12i$