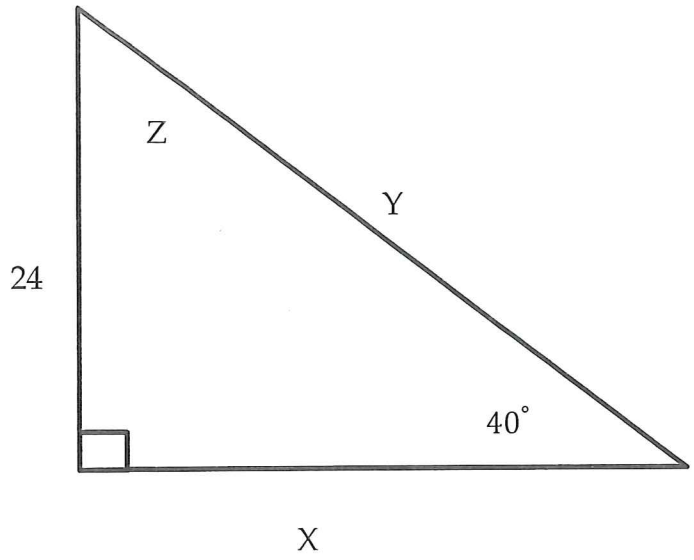
Applied Algebra 2
Final Exam Review #1

Name: KEY

Period:

For questions 1-3, please reference the following triangle.



1. Find the length of side X.

$\tan 40 = \frac{24}{x}$

$x = \frac{24}{\tan 40}$

$x = 28.6$

2. Find the length of side Y.

$\sin 40 = \frac{24}{y}$

$y = \frac{24}{\sin 40}$

$y = 37.3$

3. Find the measurement of angle Z.

$m\angle Z = 90 - 40$

$m\angle Z = 50^\circ$

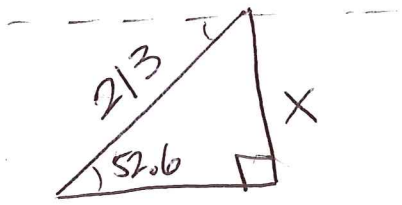
4. A safety regulation states that the maximum angle of elevation for a rescue ladder is 72°. A fire department's longest ladder is 110 feet. What is the maximum safe rescue height?

$\sin 72 = \frac{x}{110}$

$x = 110 \cdot \sin 72$

$x = 104.6$ ft

5. A man climbs 213 feet up the side of a pyramid to get away from his wife, who is standing at the foot of the pyramid where the man started to climb. The angle of depression to where his wife is standing is 52.6°. How high off the ground is the man?



$\sin 52.6 = \frac{X}{213}$

$X = 213 \cdot \sin 52.6$

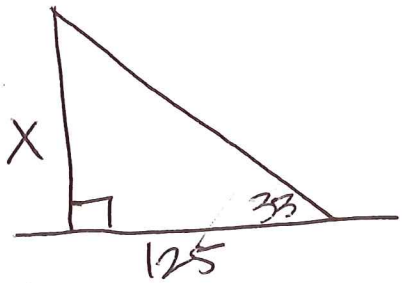
$X = 169.2$ ft.

6. The length of a shadow of a tree is 125 feet when the angle of elevation on the sun is 33°. Approximate the height of the tree.

$\tan 33 = \frac{X}{125}$

$X = 125 \cdot \tan 33$

$X = 81.2$ ft



PROBABILITY

7. A hockey team wants to elect a captain and a co-captain. If there are 14 people on the hockey team how many different sets of captain and co-captain care possible?

$14 \cdot 13 = 182$

8. Mrs. Boots needs 5 students from her class of 34 to help her move into her new classroom. How many different options are possible?

$\frac{(34 \cdot 33 \cdot 32 \cdot 31 \cdot 30)}{5!} = 278,256$

9. There are 20 members in a club. Five people are selected to go to the state conference. In how many ways can the five members be selected?

$\frac{(20 \cdot 19 \cdot 18 \cdot 17 \cdot 16)}{5!} = 15,504$

10. Get rich A survey of 4826 randomly selected young adults (aged 19 to 25) asked, "What do you think are the chances you will have much more than a middle-class income at age 30?" The two-way table shows the responses.

	Gender		
Opinion	**Female**	**Male**	**Total**
Almost no chance	96	98	194
Some chance but probably not	426	286	712
A 50-50 chance	696	720	1416
A good chance	663	758	1421
Almost certain	486	597	1083
Total	2376	2459	4826

a. If a person is randomly selected, what is the probability that they have a 50-50 chance?

$\frac{1416}{4826} = .293 = 29.3\%$

b. If a person is randomly selected, what is the probability that they are almost certain?

$\frac{1083}{4826} = .224 = 22.4\%$

c. If a person is randomly selected, what is the probability that they have some chance but probably not?

$\frac{712}{4826} = .148 = 14.8\%$

11. A bag contains 8 blue M&M's, 4 red M&M's, 5 yellow M&M's, 3 orange M&M's. Find the following probabilities. Total = 20

P (red, red) without replacement

$\frac{4}{20} \cdot \frac{3}{19} = \frac{12}{380} = .031$

3%

P (blue, blue) without replacement

$\frac{8}{20} \cdot \frac{7}{19} = \frac{56}{380} = .147$

15%

P (red, orange) without replacement

$\frac{4}{20} \cdot \frac{3}{19} = \frac{12}{380} = .031$

3%

P (blue, yellow) with replacement

$\frac{8}{20} \cdot \frac{5}{20} = \frac{40}{400} = .1$

$= 10\%$

P (orange, blue) with replacement

$\frac{3}{20} \cdot \frac{8}{20} = \frac{24}{400} = .06$

6%

P (red, blue) with replacement

$\frac{4}{20} \cdot \frac{8}{20} = \frac{32}{400} = .08$

8%

Applied Algebra 2
Final Exam Review #2

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UNITS 4, 5, and 9

Simplify the following completely.

1. $\sqrt[3]{625u^6v^3}$ • make a factor tree

$= \sqrt[3]{5 \cdot 5 \cdot 5 \cdot 5 \, uu \, uu \, vv}$

$= \boxed{5u^2v\sqrt[3]{5}}$

2. $3\sqrt{24x^3y^2}$

$= 3\sqrt{3 \cdot 2 \cdot 2 \cdot 2 \, xxx \, yy}$

$= 3(2)(x)(y)\sqrt{3(2)x}$

$= \boxed{6xy\sqrt{6x}}$

3. $\dfrac{\left(x^3y^{-4}\right)^{\frac{1}{2}}}{x^3y^{-7}}$ • Distribute 1/2

• subtract powers ($3/2 - 3$, $-4/2 - (-7)$)

$= \dfrac{x^{3/2}\,y^{-4/2}}{x^3y^{-7}} = x \quad y$

$= x^{-3/2}\,y^{10/2} = \boxed{\dfrac{y^5}{x^{3/2}}}$

• simplify fractions
• move negative powers to denominator

4. $\dfrac{\left(x^6y^{-3}\right)^{\frac{1}{3}}}{\left(x^4y^{-8}\right)^{\frac{1}{2}}} = \dfrac{x^{6/3}\,y^{-3/3}}{x^{4/2}\,y^{-8/2}} = \dfrac{x^2y^{-1}}{x^2y^{-4}}$

Distribute powers

Simplify fractions

$= y^{-1}y^{-4} = y^{-1-(-4)} = \boxed{y^3}$

Solve the equations for x.

5. $\left(\sqrt[3]{-2-5x}\right)^3 = \left(\sqrt[3]{2-3x}\right)^3$ • raise both sides to the 3rd

$-2-5x = 2-3x$ • solve for x.

$+3x \qquad +3x$

$-2 \quad -2x = 2$

$+2 \qquad +2$

$-2x = 4 \rightarrow \boxed{x = -2}$

6. $\left(\sqrt[4]{1-6x}\right)^4 = \left(\sqrt[4]{x+8}\right)^4$ • apply rules of exponents.

$1-6x = x+8$

$-x \qquad -x$

$1 \quad -7x = 8$

$-1 \qquad -1$

$-7x = 7 \rightarrow \boxed{x = -1}$

7. $\left(\sqrt[4]{3x-4}\right)^4 = \left(\sqrt[4]{x+29}\right)^4$

$3x-4 = x+29$

$-x \qquad -x$

$2x-4 = 29$

$2x = 33 \rightarrow \boxed{x = 16.5}$

8. $\left(\sqrt[3]{55-2x}\right)^3 = \left(\sqrt[3]{70-32x}\right)^3$

$55-2x = 70-32x$

$+32x \qquad +32x$

$55+30x = 70$

$30x = 15$

$\boxed{x = 1/2 \text{ or } 0.5}$

9. $4 = -5 + (x+2)^{\frac{2}{3}}$

$+5 \quad +5$

$9 = (x+2)^{2/3}$

$\left[9\right]^{3/2} = \left[(x+2)^{2/3}\right]^{3/2}$

$27 = x+2$

$\boxed{25 = x}$

10. $\left[512\right]^{2/3} = \left[(22-3x)^{\frac{3}{2}}\right]^{2/3}$

$64 = 22-3x$

$-22 \quad -22$

$42 = -3x$

$\boxed{-14 = x}$

16. $f(x)=\left(\frac{1}{2}\right)^{x-3}-1$

Growth/Decay:

Decay

Transformations:

$x-3$ → moves 3 units to the right

-1 → moves 1 unit down

Horizontal asymptote:

$y=-1$

y-intercept:

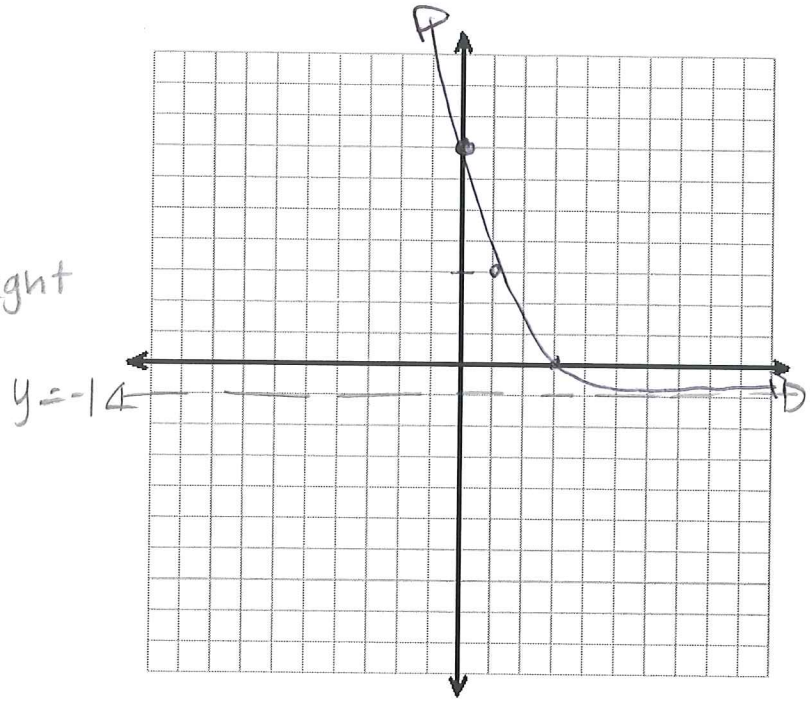
$\left(\frac{1}{2}\right)^{0-3}-1=\left(\frac{1}{2}\right)^{-3}-1=8-1=\boxed{7}$

Domain:

$(-\infty,\infty)$

Range:

$(-1,\infty)$



Use the formulas below to answer the following questions.

$y=a(1+r)^t$	$y=a(1-r)^t$	$y=a\left(1+\frac{r}{n}\right)^{nt}$	$y=Pe^{rt}$
growth	decay	Compounded	Compounded continuously

17. You deposit $5000 in a bank account. Find the balance after 5 years for each of the following situations:

a. The account pays 2.85% annual interest compounded quarterly.

Use $y=a\left(1+\frac{r}{n}\right)^{nt}$

$a=5000$ $\quad t=5$

$r=2.85\%=.0285$

$n=4$ (quarterly)

$y=5000\left(1+\frac{.0285}{4}\right)^{(4)(5)}$

$=5000(1.007125)^{20}=\boxed{\$5762.85}$

b. The account pays 3% annual interest compounded yearly.

$a=5000$

$r=3\%=.03$ $\quad t=5$

$n=1$ (yearly)

$y=5000(1+.03/1)^{5(1)}$

$=5000(1.03)^5=\boxed{\$5796.37}$

c. The account pays 2.75% annual interest compounded continuously. $y=Pe^{rt}$

$P=5000$

$r=2.75\%=.0275$

$y=5000e^{[(.0275)(5)]}$

$=\boxed{\$5737}$

d. What options is the best? Explain your answer.

2nd option because it yields more $.

se the formulas below to answer the following questions.

$y = a(1+r)^t$ growth

$y = a(1-r)^t$ decay

$y = a\left(1+\frac{r}{n}\right)^{nt}$ compounded

$y = Pe^{rt}$ compounded continuously

18. You deposit $4500 in a bank account. Find the balance after 3 years for each of the following situations:

a. The account pays 2.75% annual interest compounded weekly.

$a = \$4500$
$r = 2.75\% = .0275$
$n = 52$ (week in a year)
$t = 3$ yrs.

$y = 4500\left(1+\frac{.0275}{52}\right)^{[(52)(3)]}$
$= 4500(1.00053)^{156}$
$= \$4887.77$

b. The account pays 2.95% annual interest compounded quarterly.

$a = \$4500$
$r = 2.95\% = .0295$
$n = 4$ (quarterly)
$t = 3$ yrs

$y = 4500\left(1+\frac{.0295}{4}\right)^{[(4)(3)]}$
$= \$4914.81$

c. The account pays 3% annual interest compounded yearly.

$a = \$4500$
$r = 3\% = .03$
$n = 1$
$t = 3$

$y = 4500\left(1+\frac{.03}{1}\right)^{[(1)(3)]}$
$= 4500(1.03)^3 = \$4917.27$

d. The account pays 2.85% annual interest compounded continuously.

$P = \$4500$
$r = 2.85\% = .0285$
$t = 3$

$y = 4500e^{[(.0285)(3)]}$
$= \$4901.68$

e. What options is the best? Explain your answer.

option c, it yields more money.

19. Each year 12% of the rainforest is destroyed. If there are currently 4,000,000 acres of rainforest how many acres will be left in 11 years?

Decay

$y = a(1-r)^t$ Formula

$= 4{,}000{,}000(1-.12)^{11} = 980323.4$ acres

U

Note: $27 = 3^3$

11. $3^{3x} = 27^{6x+2}$

$3^{3x} = (3^3)^{6x+2}$

- Change to same base
- Distribute power
- Solve for x

$3x = 18x + 6$

$-18x \quad -18x$

$-15x = 6$

$x = -6/15 = \boxed{-0.4}$

12. $125^{2-2x} = 625^{2x}$

Note $5^3 = 125$ and $5^4 = 625$

$(5^3)^{2-2x} = (5^4)^{2x}$

$6 - 6x = 8x$

$+6x \quad +6x$

$6 = 14x$

$\frac{6}{14} = x$ or $\boxed{x \approx .43}$

13. $\log_2(2x-6) = 3$

- change to exponential form

$2^3 = 2x - 6$

$8 = 2x - 6$

$+6 \quad +6$

$14 = 2x$

$\boxed{7 = x}$

14. $\frac{3\log_6(x-6)}{3} = \frac{6}{3}$

- divide by 3
- change to exp. form
- solve for x

$\log_6(x-6) = 2$

$6^2 = x - 6$

$36 = x - 6$

$\boxed{42 = x}$

Graph the exponential function and find all information listed below.

15. $f(x) = -(2)^{x+1} + 2$

Growth/Decay:

Transformations:

$x+1$ → moves 1 to the left

$+2$ → moves 2 units up.

Horizontal asymptote:

$y = 2$

y-intercept: $-(2)^{0+1} + 2 = -2 + 2 = 0$

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

Range: $(-\infty, 2)$