

KING SCHOOL

Summer Assignment

MAT 414: Calculus

Calculus - Math 414
Summer Assignment
Due first day of school in September

Name: _____

1. If $f(x)=x^2+1,\ g(x)=3x-5$ and $h(x)=\begin{cases}\sqrt{x+1}, & x\geq -1\\ 2x+7, & x<-1\end{cases}$ then find:

A. $f(a+2)$

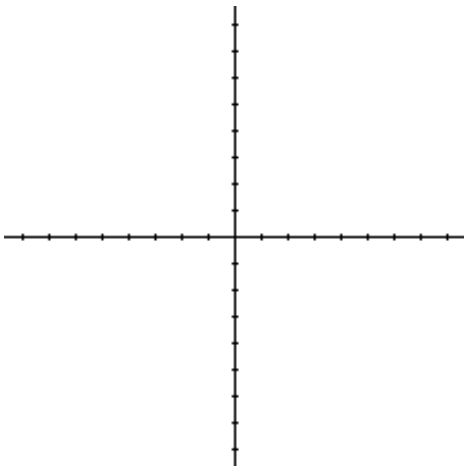
B. $(f\cdot g)(x)$

C. $h(8)$

D. $(g\circ f)(x)$

E. $g^{-1}(y)$

2. Graph $-2x+5y-6=0$ on the coordinate axes below.



3. Find the equation of the line passing through the points $P(7,2)$ and $Q(1,-7)$.

4. **A.** Write the equation of a line with *undefined slope* passing through $(7,11)$.

B. Write the equation of a line with *slope equal 0* and passing through $(3,-5)$.

5. Use any convenient method to solve the system. $\begin{cases} 7x-y=9 \\ 2x+3y=19 \end{cases}$

6. State the domain of each function below.

a. $y=\dfrac{x^2-x-6}{x+1}$

b. $y=\dfrac{x^2-x-6}{x+2}$

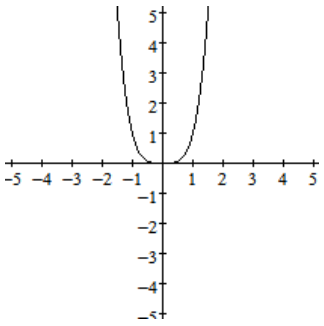
7. Define f and g so that h(x) = f(g(x)) for the following functions. Note that neither function can equal x.

a. $h(x) = \cos(3x - 11)$

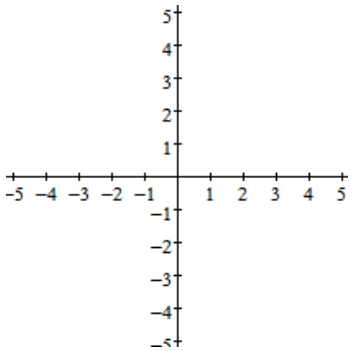
b. $h(x) = \sqrt[3]{2^x - 1}$

c. $h(x) = 3^{5-2x}$

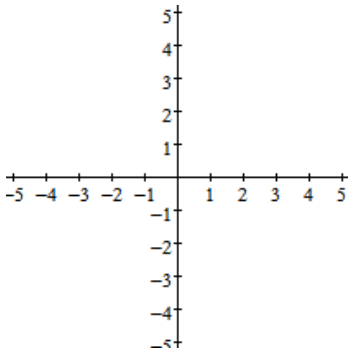
8. The graph of a certain *"parent function"* $y = f(x)$ is shown below. Sketch the graph of each of the *transformed* functions in **A – C.**



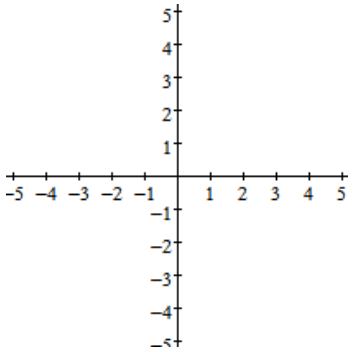
A. $y = f(x) - 3$



B. $y = f(x+1)$



C. $y = -2f(x)$



9. Describe the *"end behavior"* for the function $f(x) = x^3 - 6x^2 + 9x - 7$.

10. For $f(x) = \sin(x^2)$, $g(x) = \sqrt{x-2}$, and $h(x) = \frac{1}{x}$, write equations for each of the following compositions

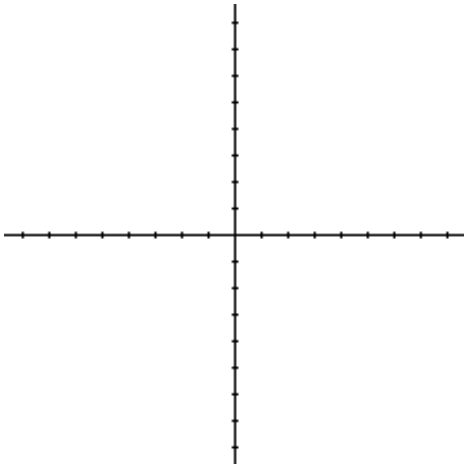
a. $f(g(x))$

b. $f(g(h(x)))$

c. $h(f(g(x)))$

d. $h(h(x))$

11. For the following rational function $y = \dfrac{2x^2 + x - 6}{x^2 - 9}$ find the equations of the *vertical and horizontal asymptotes*, the location of any *holes* in the graph. Use you calculator to graph this function and copy the results below, showing any *asymptotes* as dotted lines.



12. Each of the following examples has a *discontinuity*. Name the $x-value$ of the discontinuity's location and *what kind* of discontinuity it is.

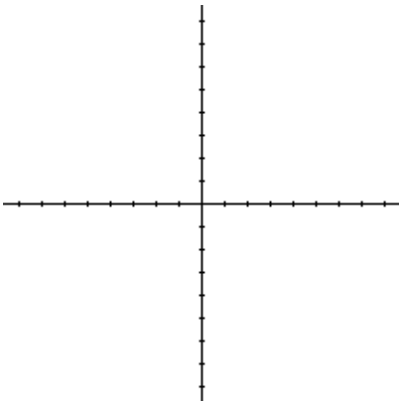
A. $f(x) = \dfrac{x-2}{x+3}$ _____

B. $g(x) = \dfrac{x^2 - 4}{x-2}$ _____

C. $h(x) = \begin{cases} x^2, x \geq 1 \\ x - 1, x < 1 \end{cases}$ _____

13. Find a **<u>cubic</u>** equation that has –3 and $1 - 2i$ as roots.

14. Sketch a graph of a *fourth degree* equation with *exactly two* different real roots.



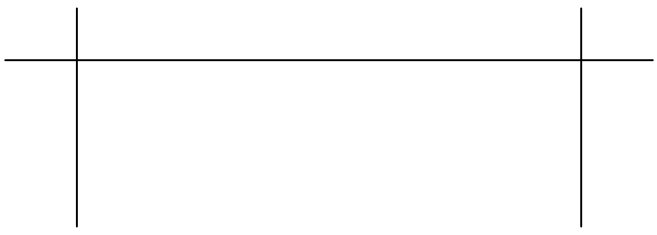
15. Write the equation of the line that passes through the point $(3,-2)$ with a slope of 7. Write your answer in point-slope form.

16. *Without* solving each equation use the *discriminant* to determine the nature (number and type) of the roots.

A. $3y^2-10y+1=0$

B. $2w^2+6w+10=0$

17. Use *synthetic division* to divide $(3x^4-5x^2+6x-5)$ by $(x+3)$. Write your answer in the space provided



Answer: _____

18. Solve $x^4 - 5x^2 - 10x - 6 = 0$ for *all* its roots.



19. Solve: $\frac{3x-4}{4} - 3 = \frac{4x-5}{3}$

20. Solve: $\frac{2}{x+2} + \frac{x^2}{x^2-4} = \frac{1}{x-2}$

21. Solve over the *real numbers*: $x - \sqrt{x+10} = 2$

22.

A. Name two angles, one positive and one negative, which are *coterminal* with $120°$.

B. Name the *reference angle* for an angle of $230°$

C. Convert an angle of $27°$ to *radians*. Leave your answer as a multiple of π.

D. Convert an angle of $\frac{4\pi}{3}$ *radians* to *degrees*.

23. Suppose $0° \le \theta \le 90°$ and $\sin(\theta) = \frac{4}{5}$. Find:

A. $\tan(\theta)$ **B.** $\cos(\theta)$

24. The terminal side of $\angle\theta$ passes through the point $(-5, 12)$. Find the following in *fraction form*.

A. $\sin(\theta)$ **B.** $\sec(\theta)$

25. **Without** using your calculator find each of the following in *simple radical form*:

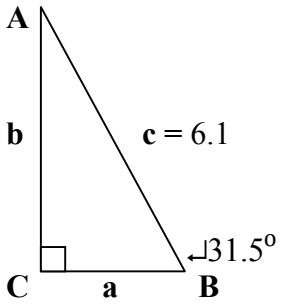
A. $\sin(60°)$

B. $\tan\left(\frac{\pi}{2}\right)$

C. $\cos(135°)$

D. $\tan\left(\frac{2\pi}{3}\right)$

26. For the triangle shown, $\angle B = 31.5^{o}$ and side $c = 6.1$

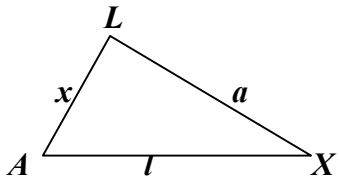


A. Find $\angle A$, accurate to one decimal place.

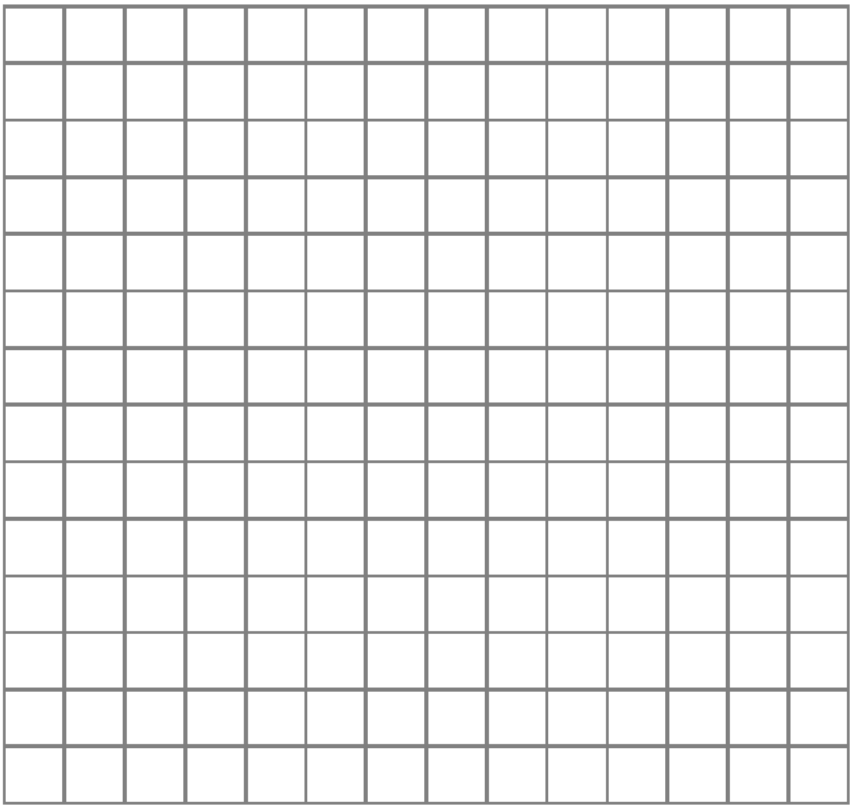
B. Find side *b* accurate to *two significant digits.*

C. Find side *a* accurate to *two significant digits.*

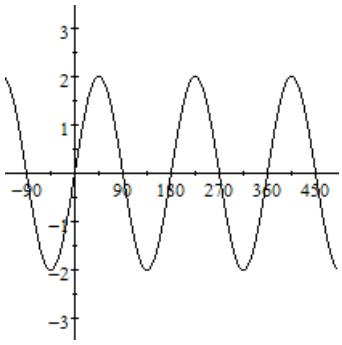
27. In *triangle LAX*, $x = 12, l = 15,$ *and* $m\angle A = 68^{o}$. Find side ***a*** accurate to one decimal place.



28. Carefully graph $f(x) = \begin{cases} \sqrt{x} & \text{for } 0 < x < 4 \\ (x-6)^2 - 2 & \text{for } 4 \leq x < 10 \end{cases}$



29. The graph at right is the graph of the *sine* function. Which of the following is an equation for the graph?



A. $y = 2\sin(\theta)$ **B.** $y = \sin(2\theta)$

C. $y = 2\sin(\theta + 45)$ **D.** $y = 2\sin(2\theta)$

30. For the function $f(x) = 4\sin(3\theta + 60)$ find the *amplitude*, *period*, and *phase shift.*

Amplitude = _____

Period = _____

Phase shift = _____

31. Express $\sqrt[3]{64s^9t^{15}}$ in simplified form, using *rational exponents*.

32. Simplify; leave your answer with rational exponents: $(5ac)^{\frac{1}{3}}\left(a^2c^3\right)^{\frac{1}{3}}$

33. Simplify; leave your answer with rational exponents: $\left(x^{10}y^2\right)^{\frac{1}{5}}y^{\frac{3}{5}}$

34. If $\sin(x) = \frac{1}{2}$ and $0 \leq x \leq \frac{\pi}{2}$, then without a calculator evaluate:

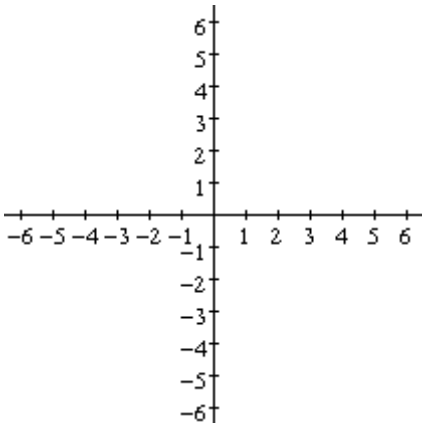
a. $\cos(x)$

b. $\tan(x)$

c. $\sec(x)$

d. $\csc(x)$

35. Plot $y = 2^{(x+1)}$ and copy your results at the right.



36. **A.** Write $3^4 = 81$ in *logarithmic form*.

B. Write $\log_2\left(\frac{1}{8}\right) = -3$ in *exponential form*.

C. Evaluate $\log_{\frac{1}{3}}(27)$

D. Evaluate $\log_5\left(5^{\pi}\right)$

E. Evaluate $7^{\log_7(17.234)}$

37. Solve: $3\log_7(4)+4\log_7(3)=\log_7(x)$

38. [5] Solve $\log_5(x-3)+\log_5(x+3)=\log_5(16)$

39. [3] Use *common logarithms* and the base change rule to evaluate $\log_7(29)$