AP Calculus AB/Solek Name
Summer Review Topics

Hey, everybody! I can't wait to teach you next year. Calculus is a difficult and demanding course, but reviewing key concepts from algebra and trigonometry in advance will ease your pain. I will make myself available several times this summer to answer your questions. (I will email you dates and times, as well as the topic(s) to be discussed.) The first session will be June 14 from 10am until noon in room 10. We will review Algebra 2 topics. A second review will be scheduled for later in the summer and will review Advanced Math topics.

Part of your calculus grade will come from series of quizzes called speed drills. Some speed drills cover calculus topics, but some cover concepts from algebra and trigonometry. Speed drills are a wonderful way to review old topics AND pad your grade, so it is in your best interest to do some advance preparation. Unfortunately, there will be little time to review, so try to refresh your memory before class begins.

Do not make the mistake of thinking you don't need to review!!! Please feel free to contact me at any time…my home email address is psolek@ssa.cad.com

Hope to see you this summer!!!

A. Monomials

For all $a \neq 0$, $b \neq 0$:

Product Rule: $a^m \cdot a^n = a^{m+n}$

Quotient Rule: $\dfrac{a^m}{a^n} = a^{m-n}$

Power Rules:
$$\begin{cases} \left(a^m\right)^n = a^{mn} \\ (ab)^m = a^m b^m \\ \left(\dfrac{a}{b}\right)^m = \dfrac{a^m}{b^m} \end{cases}$$

Special Rules: $a^0 = 1$; $a^{-n} = \dfrac{1}{a^n}$

Rational Exponents: $a^{m/n} = \sqrt[n]{a^m} = \left(\sqrt[n]{a}\right)^m$ whenever $\sqrt[n]{a}$ is defined

Simplify. Do not write answers with negative exponents.

1. $-2h^{-2} \cdot 5h^{5} \cdot h^{-6}$

2. $\dfrac{x^{n+4}(3x^{4n-1})^{2}}{6x^{2n}x^{3}}$

3. $(-3x^{2}y^{4})^{3}\,(-2x^{-2}y)^{-2}$

4. $\dfrac{(-6x^{-2}y^{-3})^{-2}}{2x^{-2}y}$

5. $\dfrac{(4ab)^{0}}{a^{0}+b^{0}}$

6. $\left(\dfrac{-3x}{5y^{-3}}\right)^{-2}$

7. a) Solve $2^a \cdot 2^{3a+1} = 16$.

b) Solve $\frac{5^{4-x}}{5^2} = 125$.

8. $16^{-3/4}$

9. $25^{3/2} \cdot 125^{2/3}$

10. $\left(-\frac{27}{64}\right)^{-4/3}$

B. Factoring

Factoring Tips

- Remember to look for GCF first.
- If a polynomial is a binomial, look for one of the following patterns:

$a^2 - b^2 = (a + b)(a - b)$ (difference of squares)
$a^3 - b^3 = (a - b)(a^2 + ab + b^2)$ (difference of cubes)
$a^3 + b^3 = (a + b)(a^2 - ab + b^2)$ (sum of cubes)

- If a polynomial contains four or more terms, factor by grouping.

Problems

Factor each polynomial completely. If a polynomial cannot be factored, write *prime*.

1. $100a^2 - 9b^2$

2. $10r^2 + 13r - 3$

3. $3p^4 - 3p^3 - 90p^2$

4. $x^4 - 16$

5. $3a^2pq + 3abpq - 90b^2pq$

6. $49z^2 - 16$

7. $225p^2 + 256$

8. $x^3 - 1000$

9. $6b^2 - 17b - 3$

10. $x^2 - 6x - 16$

11. $18m^3n + 3m^2n^2 - 6mn^3$

12. $6t^2 + 19tu - 77u^2$

13. $2p^2 + 11pq + 15q^2$

14. $40p - 32r$

15. $9m^2 - 45m + 18m^3$

16. $4x^2 + 28xr + 49r^2$

17. $54m^3 - 2000$

18. $mn - 2n + 5m - 10$

19. $2a^2 - 7a - 4$

20. $xq - 9q + xr - 9r$

21. $3a^3 - 24$

22. $9r^2 + 100$

23. $x^4 - 625$

24. $12x^2 - 17xq - 5q^2$

C. Linear Equations and Inequalities

Linear Equations

Standard form:	$Ax + By = C$
Slope-intercept form:	$y = mx + b$
Point-slope form:	$y - y_1 = m(x - x_1)$
Horizontal line:	$y = k$
Vertical line:	$x = k$

Find the slope of each line.

1. with equation $5x - 3y = 5$

2. through (2, -5) and (1, 3)

3. with equation $5x = 7y$

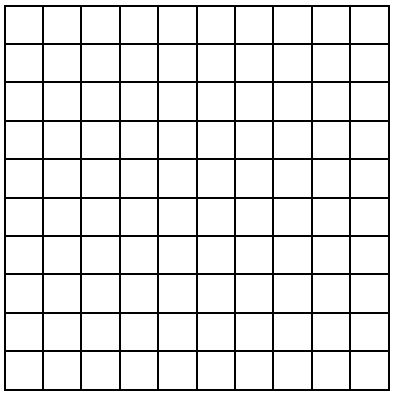
4. parallel to #1

5. with equation $x = 6$

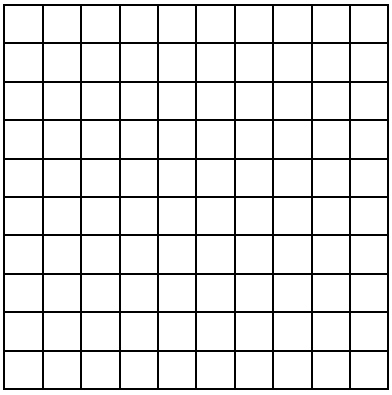
6. with x-intercept 2 & y-intercept -1

Sketch each graph on the grid provided.

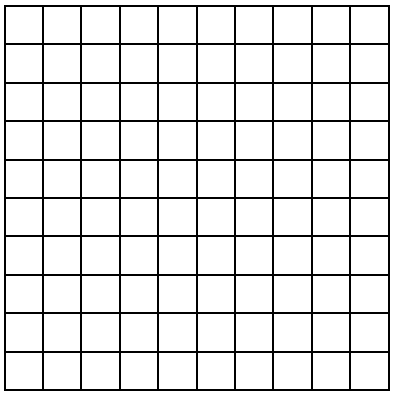
7. $y = -3x + 7$



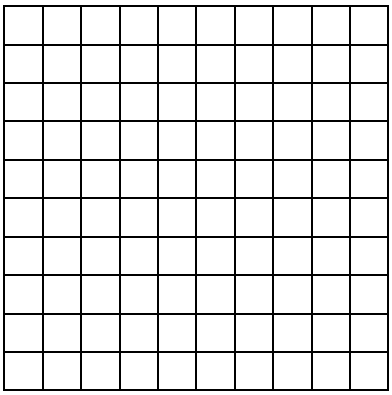
8. $x - 2 = 3$



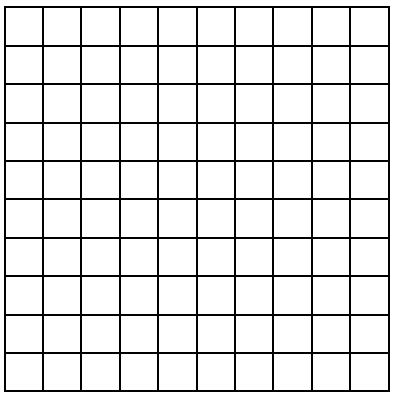
9. $4x - 5y = 20$



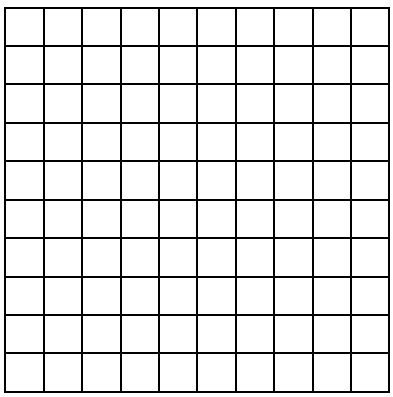
10. $3x = 4y$



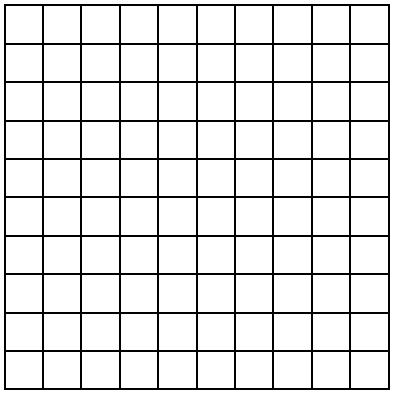
11. $f(x) = 2.5$



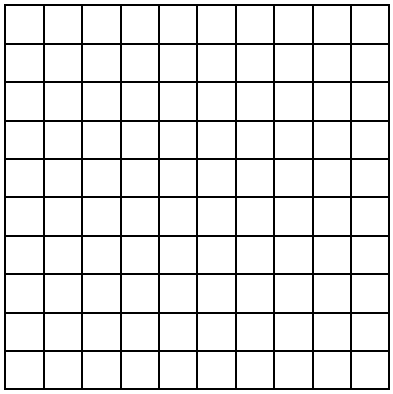
12. $5x + 2y = -5$



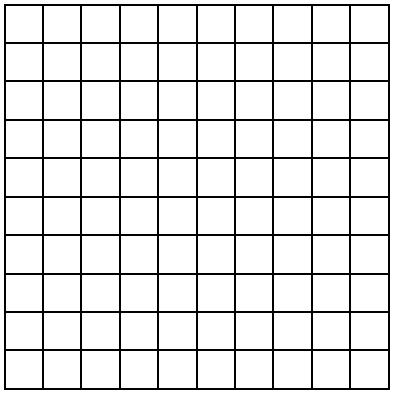
13. the line through (-2, 1) with slope -3/4



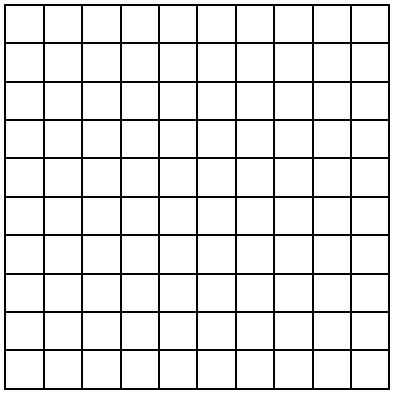
14. the line with x-intercept 5 and perpendicular to $2x - 3y = 4$



15. $2x - 3y < -6$



16. $y \geq 3/4x - 4$



Write an equation for each line described.

17. through (-3, 7); with slope –5

18. with slope ¾ and y-intercept –2

19. horizontal; through (4, 5)

20. through (2, -1) and (2, 7)

21. Give the slope-intercept form for the line described.

- It has the same x-intercept as the line with equation $5x - 2y = -35$.
- It is perpendicular to the line with equation $x - 3y = 9$.

22. Give the standard form for the equation of the line described.

- It is parallel to the line with equation $4x + 7y = 5$.
- It passes through the point (-1, -5).

23. Give the equation of the linear function f with $f(-2) = 7$ and $f(3) = 17$. Write using function notation.

D. Quadratic Equations, Inequalities, and Functions

Quadratic Equations

•Solve by factoring, using the square root property, or using the quadratic formula.

Quadratic Formula: $x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

Quadratic Functions (Graphs are parabolas.)

$f(x) = a(x - h)^2 + k$ Vertex: (h, k)

$f(x) = ax^2 + bx + c$ Vertex: $\left(-\dfrac{b}{2a}, f\left(-\dfrac{b}{2a}\right)\right)$

Solve by the specified method.

1. $3x - 9x^2 = 0$ (Factor.)

2. $x^2 + 20x + 160 = 0$ (CTS.)

Solve using any method.

3. $3x^3 + 12x^2 - 24x = 0$

4. $6x^2 - 12 = 0$

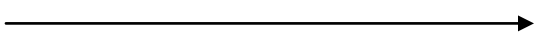
5. $(x + 3)(4x - 1) = 7(2x + 1)$

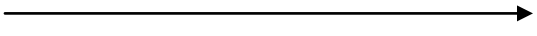
6. $(3x - 4)^2 = 18$

Graph. Give the solution set using interval or set-builder notation.

7. $25x^2 - 64 > 0$

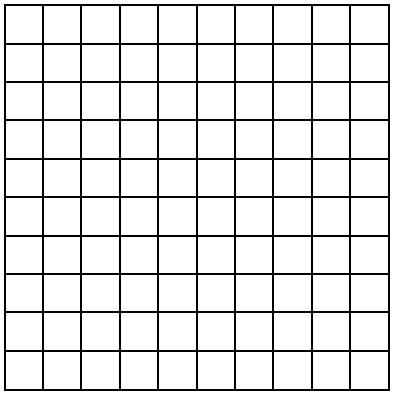
8. $3x(x-1)(2x+5) \leq 0$





Graph each quadratic function and provide the requested information.

9. $f(x) = 3 - x^2$



Vertex:

Axis of symmetry:

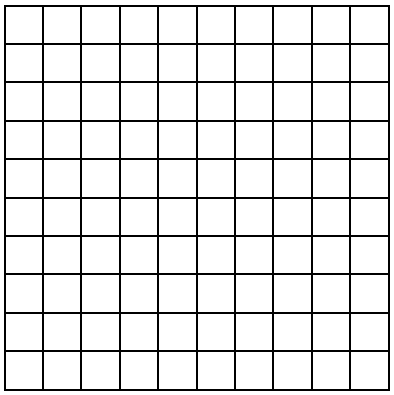
Domain:

Range:

x-intercept(s):

y-intercept:

10. $y = -2(x + 1)^2$



Vertex:

Axis of symmetry:

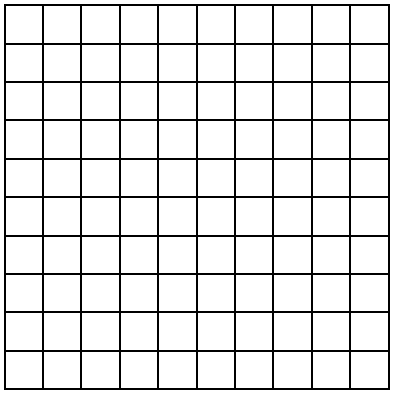
Domain:

Range:

x-intercept(s):

y-intercept:

11. $y = x^2 + 2x + 3$



Vertex:

Axis of symmetry:

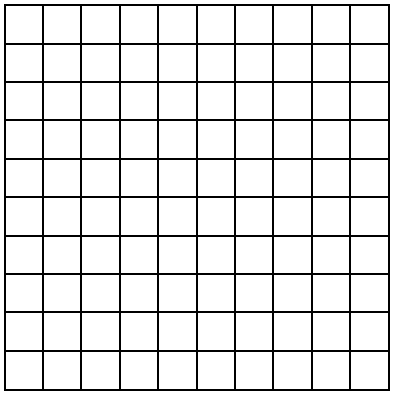
Domain:

Range:

x-intercept(s):

y-intercept:

12. $f(x) = -(x - 2)^2 + 1$



Vertex:

Axis of symmetry:

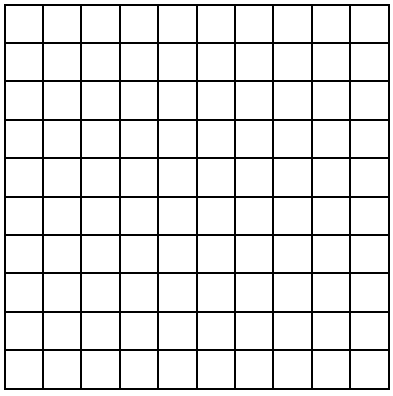
Domain:

Range:

x-intercept(s):

y-intercept:

13. $f(x) = -2x^2 - 8x + 1$



Vertex:

Axis of symmetry:

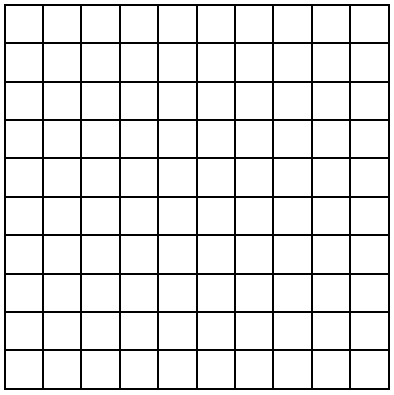
Domain:

Range:

x-intercept(s):

y-intercept:

14. $y = x^2 + 6x + 5$



Vertex:

Axis of symmetry:

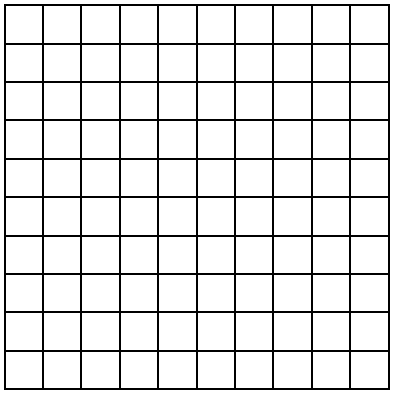
Domain:

Range:

x-intercept(s):

y-intercept:

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



Vertex:

Axis of symmetry:

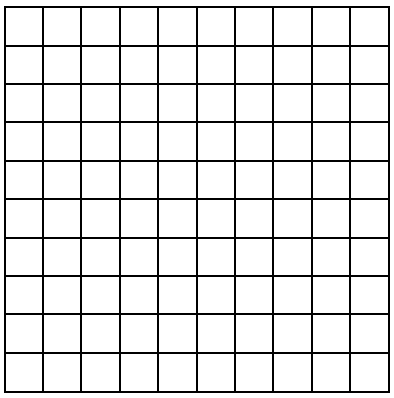
Domain:

Range:

x-intercept(s):

y-intercept:

16. $y = x^2 - 6x + 8$



Vertex:

Axis of symmetry:

Domain:

Range:

x-intercept(s):

y-intercept:

E. Trigonometry

1. Evaluate without a calculator.

a) $\sin 30^\circ$ b) $\cos 45^\circ$ c) $\tan 60^\circ$

d) $\sec 60^\circ$ e) $\csc 45^\circ$ d) $\cot 30^\circ$

2. Evaluate without a calculator.

a) $\sin 4\pi/3$ b) $\cos 3\pi/4$ c) $\tan 2\pi/3$

d) $\sec 5\pi/6$ e) $\csc \pi$ f) $\cot 11\pi/6$

g) $\sin 7\pi/3$ h) $\cos 7\pi/6$ i) $\tan \pi$

j) $\sec \pi$ k) $\csc \pi/2$ l) $\cot 3\pi/2$

m) $\sin 5\pi/2$ n) $\cos (-\pi)$ o) $\tan (3\pi)$

3. Memorize reciprocal, quotient, Pythagorean identities, and double angle identities. (You will not have a cheat sheet on the tests!!!)

Reciprocal Identities

$$\csc\theta = \frac{1}{\sin\theta}$$
$$\sec\theta = \frac{1}{\cos\theta}$$
$$\cot\theta = \frac{1}{\tan\theta}$$

Quotient Identities

$$\tan\theta = \frac{\sin\theta}{\cos\theta}$$
$$\cot\theta = \frac{\cos\theta}{\sin\theta}$$

Pythagorean Identities

$$\sin^2\theta + \cos^2\theta = 1$$
$$\tan^2\theta + 1 = \sec^2\theta$$
$$1 + \cot^2\theta = \csc^2\theta$$

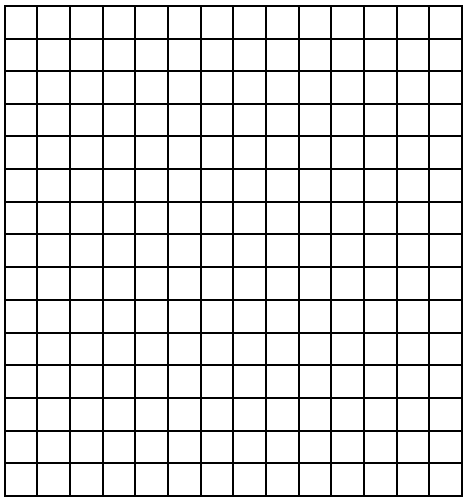
Double Angle Identities

$$\sin 2\theta = 2\sin\theta\cos\theta$$
$$\cos 2\theta = \cos^2\theta - \sin^2\theta$$
$$\cos 2\theta = 2\cos^2\theta - 1$$
$$\cos 2\theta = 1 - 2\sin^2\theta$$
$$\tan 2\theta = \frac{2\tan\theta}{1 - \tan^2\theta}$$

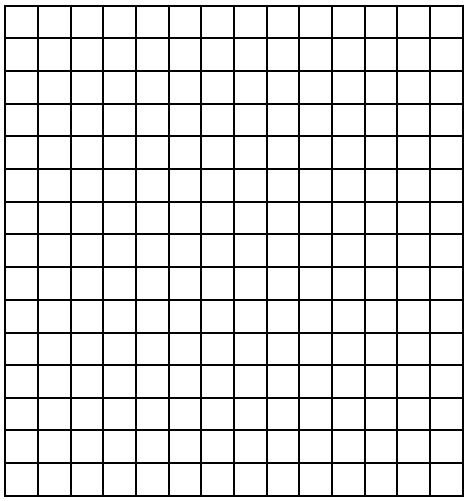
4. Get comfortable with radians!!!!! You should be able to convert the "special" angles and their multiples from degrees to radians very quickly.

5. Sketch each graph over a one-period interval.

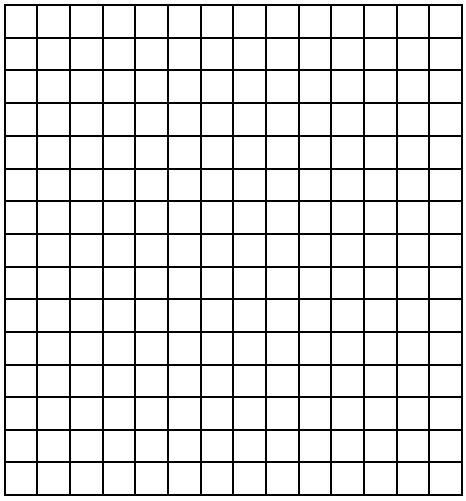
a) $y = \sin x$



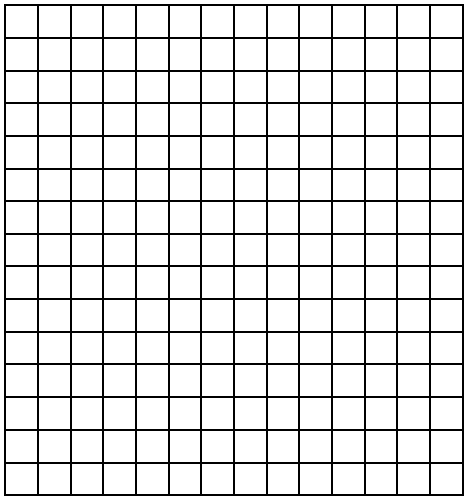
b) $f(x) = \cos x$



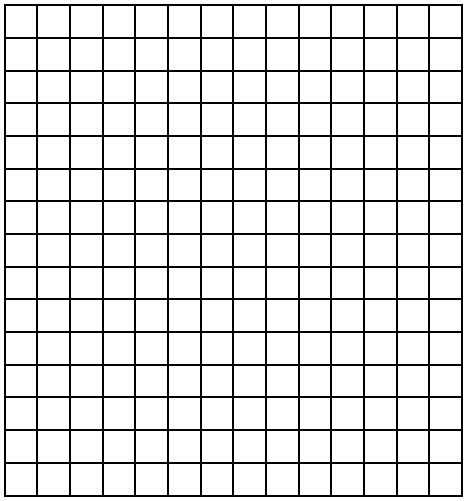
c) $y = \sin (2x)$



d) $y = 3\cos x$



e) $y = -\sin(x + \pi/2)$



f) $y = 4 - \cos x$