Topics to be covered:

- Solving linear equations algebraically
- Solving quadratic equations by the Quadratic formula
- Graphing applications with the calculator
  - Graphing functions in a friendly window
  - Solving equations using the graphing features of the calculator
  - Finding the critical points of a function using the calculator
  - Finding the intersection(s) between two functions using the calculator
- Finding the equation of a line <u>without</u> the aid of the Calculator
- Finding the equation of a parabola <u>without</u> the aid of the Calculator (from roots, from vertex)
- Building and using Linear and Quadratic models
- Function vocabulary and notation

A Few Practice Problems for Midterm 2

Notes: Be sure you write neatly using complete sentences and correct grammar.   Diagrams should be included where appropriate. Neatness and organization are necessary for full credit. Consider every one of these questions as a possible test question. If you cannot figure out how to do the problem on your own come by for hints and help before the last minute.

1a)   Outline the steps needed to algebraically solve a <u>linear equation</u> of the form $f(x) = g(x)$.

1b)   Outline the steps needed to algebraically solve a <u>quadratic equation</u> of the form $f(x) = g(x)$.

Be able to solve any quadratic or linear equation plus a few radical equations.

2) Solve for x $$\frac{3a-5x}{2} = -4b$$	3) Solve for b $$A = \frac{a+b}{2} \cdot h$$	4) Solve for x $$\frac{3x^2}{2} - \frac{5}{4} = x^2 + \frac{3}{4}$$	5) Solve for y $$y = \sqrt{1+y^2}$$
6) Solve for b $$\frac{a-b}{4b} = 10a$$	7) Solve for a $$a \cdot w + 1 = \frac{a+b}{3}$$	8) Solve for y $$a \cdot x^2 + b \cdot y^2 = 1$$	9) Solve for a $$1 = \sqrt{\frac{a}{b}(x-y)}$$
10) Solve for b $$D = \frac{\sqrt{b^2-4ac}}{2a}$$	11) Solve for z $$\sqrt{a \cdot z^2 + b} - 1 = 0$$	12) Solve for R $$V = \frac{4\pi R^3}{3}$$	13) Solve for y $$\sqrt{x^2+y^2} = x$$
14) Solve for W $$F = \frac{1}{2} \cdot \sqrt{\frac{W}{L}}$$	15) Solve for x $$-2(3x-1) + \frac{7}{2} = \frac{3(x-9)}{3}$$	16) Solve for x $$(x+1) - \frac{3}{2} = \frac{2x+3}{2}$$	17) Solve for x $$\frac{3x-7}{5} + 2 = |9-13|$$
18) Solve for x $$\frac{3-x}{2} + \frac{2}{3} = 1 - \frac{3 \cdot (2x-5)}{2}$$	19) Solve for r $$S = 2\pi r + r\,h$$	20) Solve for x $$\frac{3x^2}{4} - \frac{3}{2} = \frac{3x}{2} + \frac{9}{2}$$	21) Solve for h $$S_A = \pi r h + 2\pi r^2$$

Be able to solve equations graphically (intersection method)

22) Solve for k: (a) $k(3k + 5) + 6 = 18$ (b) Solve for Q: $3Q^2 + \sqrt{5Q + 6} = 7Q^3 + 2Q - 5$

23) Solve for x: (a) $6 - 4x(x + 2) + 1 = x^3 + 12$ (b) Solve for y: $2y \cdot \dfrac{y + 1}{3 - y} + 4y = \dfrac{(6y - 1)(y + 2)}{2y + 3}$

24) Be able to find roots, y-intercepts, maxima and minima.

   (a) $y = x^3 - 2x^2 - 63x$ (b) $y = x^3 + 8x^2 - 12$

25) Find the equation of the line through (a) (6, -7) and (-2, 3)   (b) (-152, 78) and (-213, 93)

26) Find the equation of the line through (a) (x_0, y_0) and $(a, f(a))$ (b) (a, b) with slope $\dfrac{\Delta y}{\Delta x}$

27) Find the equation of the line through (5, -7) and parallel to $6x - 9y = 108$

28) Find the equation of the line through (-8, 12) and perpendicular to $y = -0.6\,x + 20$

29) Graph (a) $y = -\frac{3}{4}x + 24$ (b) $y = -0.6\,x + 20$ (c) $6x - 9y = 108$ (d) $5(x - 2y) + 3x - 4y = 2x + 7$

30) Graph the quadratic and adjust the viewing window to show all four critical points accurate to the hundredth's place. $y = -0.1x^2 - 0.5x + 15$.
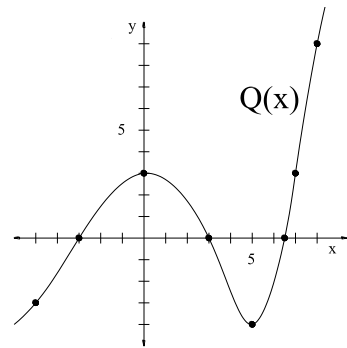
31) Find all intersections of $P = 4w^2 - 5w - 8$ and $P = w^3 - w$

32) Give the following: a) $Q(-5)$ b) $Q(7)$ c) $Q(0)$

33) a) Solution to $Q(x) = 9$ b) Solution to $Q(x) = 3$ c) All roots

   d) All extrema   e) y-intercept

34) Give the domain of each function:

   (a) $y = \dfrac{x+1}{x-1}$ (b) $y = \sqrt{x-1}$ (c) $y = ax^2 + bx + c$ (d) $y = mx + b$

35) Let t = time to run 100 m. E = elevation at which the time trial is conducted. Which is the independent variable? Is this a function?

   (a) Use the data to find the appropriate relationship. @ sea level, 10 sec; @ 3,000', 10.9 sec; @ 5,000', 12.5 sec; @ 10,000' 20 sec.

   (b) How fast will the person run 100m on Mt Everest at 29,000'?

   (c) At what elevation would the person be expected to run 100m in 15 sec?

36) Gina buys Duck T-shirts for $7 which she sells at Duck games for $15. She had to purchase a stadium permit for $500. Let x = # of T-shirts.

   (a) Write a linear equation for Gina's Expenses.

   (b) Write a linear equation for Gina's Revenues.

   (c) Write a linear equation for Gina's Profits.

   (d) How many T-shirt must Gina sell to breakeven?

   (e) If she buys and sells 100 T's what is her profit?

   (f) If she wants to make $2500, how many T's must she sell?

1a) Outline the steps needed to algebraically solve a <u>linear equation</u> of the form f(x) = g(x).
- Convert subtraction to addition
- Distribute
- Find LCD, put a [term] around each term. Multiply each term by the LCD and cancel
- Simplify
- Shift all 'x-terms' to one side
- Shift all 'non-x-terms' to other side
- If necessary write as (coefficient)×(x)
- Divide out coefficient
- Check answer

1b) Outline the steps needed to algebraically solve a <u>quadratic equation</u> of the form f(x) = g(x).
- Put all terms on one side, set equal to zero and write in the form $ax^2 + bx + c = 0$
- Use Quadratic Formula (QF) to solve (or use alternate method)

2) $x = \dfrac{3a + 8b}{5}$

3) $b = \dfrac{2A - ah}{h}$

4) $x = \pm 2$

5) no sol'n or Ø

6) $b = \dfrac{a}{40a + 1}$

7) $a = \dfrac{b - 3}{3w - 1}$

8) $y = \pm\sqrt{\dfrac{1 - ax^2}{b}}$

9) $a = \dfrac{b}{x - y}$

10) $b = \pm\sqrt{(2aD)^2 + 4ac}$

11) $z = \pm\sqrt{\dfrac{1 - b}{a}}$

12) $R = \left(\dfrac{3V}{4\pi}\right)^{1/3}$

13) $y = 0$

14) $W = 4LF^2$

15) $x = 29/14$

16) no sol'n or Ø

17) $x = 17/3$

18) $x = 38/15$

19) $r = \dfrac{S}{2\pi + h}$

20) $x = 4, x = -2$

21) $h = \dfrac{S_A - 2\pi r^2}{\pi r}$

22) $k = 4/3, -3; Q \approx 1.12$ 23) $x = -1; y = -7.065$

24a) Roots: (-7, 0), (0, 0), (9, 0); max: ~(-3.96, 158); min: ~(5.30, -241); y-int: (0, 0)

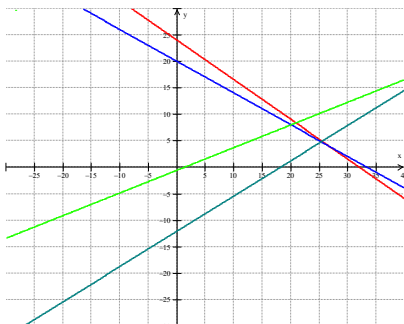24b) Roots: (1.254, 0); max: unbounded; min: unbounded; y-int: (0, -12)

25) $y = \dfrac{-5}{4}x + \dfrac{1}{2};$ $y = \dfrac{-15}{16}x + \dfrac{2478}{61}$

26) $\dfrac{y - y_0}{x - x_0} = \dfrac{y_0 - f(a)}{x_0 - a}; \dfrac{y - b}{x - a} = \dfrac{\Delta y}{\Delta x}$

27) $y = \dfrac{2}{3}x - \dfrac{31}{3}$

28) $y = \dfrac{5}{3}x + \dfrac{76}{3}$

29)

30) Roots: (-15, 0), (10, 0); vertex: (-2.5, 15.625); y-int: (0, 15)

31) ~(0.93, 1.24)   32) Q(-5) = -3, Q(7) = 3, Q(0) = 3

33) Q8) = 9; x = 0, 7; roots: {x = ±3, 6 $\frac{1}{2}$ }; max: (0, 3); min: (5, -4); y-int: (0, 3)

34) (a) x ≠ 1; (b) x ≥ 1; (c) all reals; (d) all reals

35) Let t = time to run 100 m. E = elevation at which the time trial is conducted.

Which is the independent variable? x = elev; time depends on elevation.

Is this a function? yes, assuming there is one time for each elevation.

(a) Use the data to find the appropriate relationship. @ sea level, 10 sec; @ 3,000', 10.9 sec; @ 5,000', 12.5 sec; @ 10,000' 20 sec. $y = ax^2 + bx + c$; $a = 10^{-7}$, $b = 2 \times 10^{-16}$, $c = 10$

(b) How fast will the person run 100m on Mt Everest at 29,000'? 94.1 sec

(c) At what elevation would the person be expected to run 100m in 15 sec? 7,071'

36) Gina buys Duck T-shirts for $7 which she sells at Duck games for $15. She had to purchase a stadium permit for $500. Let x = # of T-shirts.

(a) Write a linear equation for Gina's Expenses. E = 500 + 7x

(b) Write a linear equation for Gina's Revenues. R = 15x

(c) Write a linear equation for Gina's Profits. P = 15x – [500 + 7x]

(d) How many T-shirt must Gina sell to breakeven? 63 T's

(e) If she buys and sells 100 T's what is her profit? $300

(f) If she wants to make $2500, how many T's must she sell? 375 T's