The second midterm will be held on Friday, November 18 from 11:00–11:50am for Section A and 3:00–3:50pm for Section B in our regular classroom WLH 2204. The exam will cover materials from after the first midterm to the end of the lecture on Wednesday 11/16. They are corresponding to homework assignments 5 to 8. Bring your Blue Book and calculator. This time, exam answer written on loose papers will NOT be accepted. Below are a few highlighted topics.

- Definition of a square root. Finding positive (principal) and negative square root of a given nonnegative number.
- Definition of an $n$-th root. Results for $\sqrt[n]{a^n}$ and $(\sqrt[n]{a})^n$ (remember the absolute value).
- Given two real numbers $a, b$ and positive integers $m, n$. Review the properties for $a^0, a^{-m}, a^{m+n}, a^{m-n}, a^{mn}, (ab)^m$ and $(\frac{a}{b})^m$.
- Definition of rational exponent $a^{m/n}$ for a real number $a$ and positive integers $m, n$ that share no common factors and $n > 1$. Converting between rational exponent and radical notation: $a^{m/n} = \sqrt[n]{a^m} = (\sqrt[n]{a})^m$.
- Multiplication and division property of radicals. Simplified form of a radical. Know how to simply a radical expression.
- Definition of like radicals. Addition and subtraction of radicals. Note: sometimes it is necessary to simplify the radicals before adding or subtracting.
- Identities for perfect squares $(a + b)^2, (a - b)^2$ and difference between two squares $a^2 - b^2$.
- Solving quadratic equation $ax^2 + bx + c = 0, (a \neq 0)$ using the three methods: (1.) factoring and zero product rule, (2.) complete the square, and (3.) quadratic formula. Solving equations that involve radical expressions. Solving equations that is quadratic in form. Remember to check your answer!
- Using the discriminant $b^2 - 4ac$ to find the number of real-valued solutions in the quadratic equation $ax^2 + bx + c = 0$. This is also the number of $x$-intercept of $ax^2 + bx + c$.
- Pythagorean theorem that relates the lengths of three sides of a right triangle.
- Solving rational equations that can be transformed into quadratic.
- Writing a quadratic function $ax^2 + bx + c$ into the form $a(x - h)^2 + k$. Finding vertex, axis of symmetry, $x$-intercept, $y$-intercept, and max/min value of $ax^2 + bx + c$. (Monday 11/14)
- Lastly, review all the exercises from the homework assignments. The next page has some extra sample exercises for you to practice.
1. Perform the following operations. Write your final answer in simplified radical form. Assume the variables represent positive real numbers. Do not use calculator for this problem.

\[
\begin{align*}
(a) & \quad \frac{2}{3}\sqrt{45} + \frac{3}{4}\sqrt{80}, \quad (b) \quad 3x^2\sqrt{18} + x\sqrt{8x^2}, \quad (c) \quad 5\sqrt{7} - 8t^2\sqrt{3}, \quad (d) \quad (-4\sqrt{k^7})\left(\sqrt{10}\right) \\
(e) & \quad (a + 3\sqrt{a}) (3a + 2\sqrt{a} - 2), \quad (f) \quad \left(5\sqrt{3} - 4\sqrt{7}\right) \left(5\sqrt{3} + 4\sqrt{7}\right), \quad (g) \quad \sqrt{x} \cdot \sqrt{x}, \quad (h) \quad \sqrt{6} \cdot \sqrt{2}, \\
(i) & \quad \frac{3m^2}{\sqrt{m}}, \quad (j) \quad \sqrt{x^2 - 4x + 4}, \quad (k) \quad 1.2\sqrt{32} + 2.1\sqrt{16} - 4.5\sqrt{8}, \quad (l) \quad s^{3/5} \cdot s^{7/5}, \quad (m) \quad \left(a^2b^{-4}\right)^{3/2}, \\
(o) & \quad \sqrt{\frac{a^2}{64a}}, \quad (p) \quad \frac{\sqrt{p^2}}{3\sqrt{8p}}, \quad (q) \quad \frac{3}{\sqrt{5} - \sqrt{11}}, \quad (r) \quad \frac{4 - \sqrt{3}}{4 + \sqrt{3}}.
\end{align*}
\]

2. Solve the following quadratic equations. You should try to use all three methods, if able. On the exam, I may force you to use a specific method.

\[
\begin{align*}
(a) & \quad x^2 - 29x + 100 = 0, \quad (b) \quad 6x^2 - 47x - 8 = 0, \quad (c) \quad 3x^2 + 8x + 1 = 0.
\end{align*}
\]

Note: part (c) is not factorizable so use either quadratic formula or completing the square.

3. Solve the following equations. Always remember to check your answer!

\[
\begin{align*}
(a) & \quad \sqrt{9x^2 + 7x - 18} = 3x, \quad (b) \quad \sqrt{x + 3} - \sqrt{3x + 11} = 0, \quad (c) \quad \sqrt{2x^2 - 5x - 12} + 4 = x.
\end{align*}
\]

4. Find the slope of the line through the points \((3, 4\sqrt{5})\) and \((1, 8\sqrt{5})\).

5. The formula \(S = 0.07d^{3/2}\) describes the duration of a storm, \(S\), in hours, whose diameter is \(d\) miles. Determine the duration of a storm with diameter of 5 miles. Round your answer to the nearest hundredth.

6. Find the exact perimeter of a rectangle whose width is \(\sqrt{32}\) in. and whose length is \(\sqrt{8}\) in.

7. A new LED TV is listed as being 32 in. This distance is the diagonal distance across the screen. If the screen measures 20 inches in height, what is the actual width of the screen?

8. A cellphone screen has a diagonal length of 6 in. The length of the screen is twice its width. Find the dimensions (length \(\times\) width) of the screen. Round your answer to the nearest tenth of an inch.

9. The following equations are quadratic-in-form. First identify the substitution and transform the given equation into quadratic. Then solve for the unknown \(x\).

\[
\begin{align*}
(a) & \quad x^{2/3} - 8x^{1/3} + 15 = 0, \quad (b) \quad 4x^{-2} - 5x^{-1} + 1 = 0, \quad (c) \quad \left(\frac{x - 2}{4}\right)^2 - 3\left(\frac{x - 2}{4}\right) + 4 = 0, \\
(d) & \quad 3x + 8\sqrt{x} - 3 = 0, \quad (e) \quad 4\left(\frac{x + 1}{x - 1}\right)^2 + 19\left(\frac{x + 1}{x - 1}\right) - 5 = 0.
\end{align*}
\]

10. Solve the following rational equations.

\[
\begin{align*}
(a) & \quad 6 = \frac{5}{x} + \frac{6}{x^2}, \quad (b) \quad \frac{x(2x + 1)}{x - 4} = \frac{36}{x - 4}, \quad (c) \quad 2 = \frac{1}{x} + \frac{1}{x - 4}.
\end{align*}
\]
(d) \( \frac{2}{x+1} + \frac{1}{x-1} = 1 \),  
(e) \( \frac{1}{x-6} + \frac{x}{x-2} = \frac{4}{x^2-8x+12} \).

Note: part (b) was solved during the discussion of 11/10.

11. Given the quadratic function \( f(x) = x^2 - 14x + 48 \).

   a. Find the discriminant and use it to determine if there is any \( x \)-intercept. If so, find all the \( x \)-intercept(s).

   b. Find all the \( y \)-intercept.

   c. Use completing the square technique to transform the given formula into the form \( a(x - h)^2 + k \).

   d. Identify the vertex and the axis of symmetry.

   e. Identify the maximum or minimum value of the function. Find the \( x \)-value at which this max/min occurs.