## Math 130 Exam #2 Review Sheet – Spring 2016

***Please Note:*** The exam will cover 2.8-3.5. The review sheet is designed for you to have a guide as to what to study. The problems on the exam are not limited to the type of problems on this sheet. Any types of problem from the assigned homework problems are possible exam questions. Please attempt other practice problems other than those presented on this sheet in order to be completely prepared for the exam.

*1.* Sketch the graph of each of the following functions by using techniques of shifting, compressing, stretching, and/or reflecting.

      *a.* $f(x) = x^2 + 4$

      *b.* $f(x) = \sqrt{x} - 3$

      *c.* $f(x) = -x^3 + 2$

      *d.* $f(x) = (x+2)^3 - 4$

      *e.* $f(x) = 3(x-2)^2 + 1$

      *f.* $f(x) = -2|x-3| + 4$

*2.* Write the function whose graph is the graph of $y = x^3$, but is:

      *a.* Shifted up 4 units.
      *b.* Shifted right 3 units.
      *c.* Reflected about the *x*-axis, shifted up 3 units and shifted left 2 units.

*3.* Graph each of the following quadratic functions. Determine the vertex, axis of symmetry, intercepts, and the symmetric point.

      *a.* $f(x) = x^2 - 6x + 9$

      *b.* $f(x) = 2x^2 - x + 2$

      *c.* $f(x) = 2x^2 + 5x + 3$

*4.* Use synthetic division to find the quotient $q(x)$ and the remainder $R$ when $f(x)$ is divided by $g(x)$.

      *a.* $f(x) = x^3 + 2x^2 - 3x + 1$;   $g(x) = x + 1$

      *b.* $f(x) = -4x^3 + 2x^2 - x + 1$;   $g(x) = x + 2$

      *c.* $f(x) = x^4 + x^2 + 2$;   $g(x) = x - 2$

      *d.* $f(x) = x^5 + 1$;   $g(x) = x + 1$

5. Use synthetic division to determine whether $x-c$ is a factor of $f(x)$. Then, use the factor theorem to determine whether $x-c$ is a factor of $f(x)$.

    a. $f(x) = -4x^3 + 5x^2 + 8; \quad x+3$

    b. $f(x) = 2x^6 - 18x^4 + x^2 - 9; \quad x+3$

    c. $f(x) = 4x^4 - 15x^2 - 4; \quad x-2$

6. Given the following functions.

$$f(x) = 3x^2 - 4x + 2$$

$$g(x) = \frac{5x}{x-4}$$

$$h(x) = -4x^2 + 2x + 8$$

$$k(x) = \frac{x-3}{x+5}$$

Evaluate:

    a. $(f+g)(x)$

    b. $(f-h)(2)$

    c. $\left(\dfrac{f}{h}\right)(x)$

    d. $f(x-3)$

    e. $(g \circ h)(x)$

    f. $(h \circ f)(x)$

    g. Domain $(f+g)$

    h. Domain $(h \cdot k)$

    i. Domain $\left(\dfrac{g}{k}\right)$

    j. Domain $(g \circ k)$

7. Find all real and complex zeros of the following polynomial equations.

    a. $3x^3 - 5x^2 + 2x - 8 = 0$

    b. $x^4 - 5x^3 + 3x^2 + 15x - 18 = 0$

    c. $2x^3 + 3x^2 + 2x + 3 = 0$

    d. $2x^3 - 11x^2 + 10x + 8 = 0$

    e. $x^4 - 2x^3 + 10x^2 - 18x + 9 = 0$

f. $x^3 - 8x^2 + 25x - 26 = 0$

g. $2x^4 + x^3 - 35x^2 - 113x + 65 = 0$

8. Graph the following functions. For each function: *(i)* Find the *x*-intercept(s), *(ii)* Find the *y*-intercept, *(iii)* Use the *x*-intercept(s) to find the intervals on which the graph of *f* is above or below the *x*-axis, *(iv)* End behavior: find the power function that the graph of *f* resembles for large values of $|x|$, *(v)* Determine whether the graph crosses or touches the *x*-axis at each *x*-intercept.

a. $f(x) = x^3 - 2x^2 - 9x + 18$

b. $f(x) = x^4 - 10x^2 + 9$

c. $f(x) = -3(x-7)(x+3)^2$

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

e. $f(x) = x^2(x-3)(x+1)$

9. Given the following functions. Determine the *x*-intercept(s), *y*-intercept, vertical asymptote(s), horizontal asymptote, table of values, and the graph.

a. $f(x) = \dfrac{3x-2}{x^2 - 4x + 3}$

b. $f(x) = \dfrac{3x-4}{x-3}$

c. $f(x) = \dfrac{x^2 - 3x - 4}{x+2}$

10. Find the horizontal or oblique asymptote of the following.

a. $y = \dfrac{3x+4}{9-5x}$

b. $y = \dfrac{4x^2 - 5x + 2}{2x-3}$

*11.* Find the vertical asymptote(s) of the following.

    *a.* $y = \dfrac{3x}{x^2 + 5x + 6}$

    *b.* $y = \dfrac{6x}{x^3 - 4x^2 + 4x}$

*12.* David has available 400 yards of fencing and wished to enclose a rectangular area. Express the area $A$ of the rectangle as a function of the width $x$ of the rectangle. For what value of $x$ if the area largest? What is the maximum area?

*13.* A farmer with 4000 meters of fencing wants to enclose a rectangular plot that borders on a river. If the farmer does not fence the side along the river, what is the largest are that can be enclosed?