MPS22 – Precalculus
Final Exam Review Sheet

The final exam will consist of 8 problems similar to those below.
You must choose any 5 of these 8 problems. Each problem is worth 20 points.
(Note: You must complete all parts of the problems you select in order to earn full credit.)

1. (a) Find the time required for an investment of $5,000 to grow to $8,000 at an interest rate of 7.5% per year, compounded quarterly.
    (b) Solve for x: $\ln(x+1) - \ln 8 = 2$
    (c) Expand: $\ln\left(\dfrac{4x^2}{y^3\sqrt{z}}\right)$

2. (a) Given the graph of $f(x)$ on the right, find each limit, if it exists. If the limit does not exist, state one of the following DNE, DNE $(+\infty)$, or DNE $(-\infty)$.

    $\lim\limits_{x\to 4} f(x)$ $\qquad$ $\lim\limits_{x\to 1^+} f(x)$

    $\lim\limits_{x\to 1} f(x)$ $\qquad$ $\lim\limits_{x\to -\infty} f(x)$
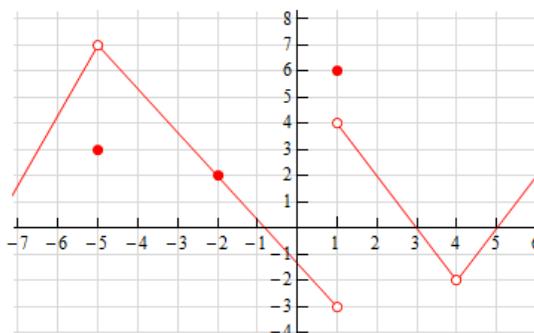
    (b) Compute using algebraic techniques: $\lim\limits_{x\to 5} \dfrac{x-5}{x^2-25}$.

3. (a) In a geometric sequence $a_5 = 243$ and $a_9 = 3$. Find a_1 and find an explicit formula for a_n.
    (b) Find a_4 given the recursively defined sequence below:
    $$a_1 = 5$$
    $$a_{k+1} = a_k + 4$$

4. (a) Find the six trigonometric functions of the angle θ (in standard position) whose terminal side passes through the point $(5,-2)$.
    (b) Sketch the angle $-390°$ in standard position and state one positive and one negative coterminal angle.

5. (a) Write the equation of a sine curve with period 20π, amplitude 7, and with a minimum value of -2.
    (b) Find the exact value of $\cos\dfrac{17\pi}{3}$ in simplest radical form.

6. (a) List all the *possible* rational roots of $f(x) = 7x^3 - 11x^2 - 3x + 4$.
    (b) Use synthetic division to find all of roots in simplest radical form.

7. Solve for all values of x on the interval $0 \le x < 2\pi$: $\qquad \cos 2x - 1 = 3\cos x$

8. (a) Plot the point $\left(3, \frac{7\pi}{6}\right)$ on the polar plane below.
    (b) State *two* other sets of polar coordinates that represent the point $\left(3, \frac{7\pi}{6}\right)$ where $r < 0$.
    (c) Find the exact rectangular coordinates of the point $\left(3, \frac{7\pi}{6}\right)$.