

Pre-Calculus Review Problems

These problems are intended as an optional review and self-diagnostic test of your knowledge of standard pre-calculus material. This is *not* to be handed in. Solutions will be posted on the section website. It is not necessary that you get every problem correct, but if you are having trouble with *many* of the problems, you should speak to someone (your instructor, or a TA) during office hours.

1 Algebra and Geometry

Problem 1. Give equations for the following lines in *both* point-slope and slope-intercept form.

- (a) The line which passes through the point $(1, 2)$ having slope 4.
- (b) The line which passes through the points $(-1, 1)$ and $(2, -1)$.
- (c) The line parallel to $y = \frac{1}{2}x + 2$, with y -intercept $(0, -1)$.
- (d) The line perpendicular to $y = -3x + 1$ which passes through the origin.

Problem 2. Find the point of intersection, if there is one, between the following lines:

- (a) $y = -x + 5$ and $y - 2 = 3(x + 1)$
- (b) The line passing through $(-1, -2)$ and the origin, and the line $y = 2x - 2$.

Problem 3. Find all real roots x of the following polynomials, and factor into irreducible polynomials.

- (a) $6x^2 + 5x + 1$
- (b) $-x^2 + x + 1$
- (c) $2x^2 - 3x + 5$
- (d) $x^3 + 6x^2 - 7x$
- (e) $x^3 - x^2 + x - 1$
- (f) $x^4 - 2x^2 + 1$

Problem 4. Solve the following equations for x .

- (a) $3\sqrt{x} = x - 4$
- (b) $\sqrt{x+2} + \sqrt{x-2} = \sqrt{4x-2}$
- (c) $x = 4\sqrt[3]{x}$.
- (d) $\frac{x-1}{x-2} + \frac{2x+1}{x+2} = 0$

Problem 5. Find the equations of the following circles.

- (a) A circle of radius 2, centered at $(1, 2)$.
- (b) A circle centered at the origin, and tangent to the line $y = -2x + 2$.

2 Exponents and Logarithms

Problem 6. Simplify the following expressions.

- (a) $\frac{x^2(x^3)^4}{x^4}$
- (b) $9^{1/3} \cdot 9^{1/6}$
- (c) $(\sqrt{3})^{1/2} \cdot (\sqrt{12})^{1/2}$

Problem 7. Simplify the following expressions.

(a) $\log_9(3) \log_5(1/25)$

(b) $\ln(\ln(e)) + \log_2(8)$

(c) $2\ln(3x-4) - 5\ln(2x-7)$ (write as an expression containing a single logarithm)

3 Inequalities

Problem 8. Solve for x in the following inequalities, i.e., find the set of all x which satisfy the given inequality.

(a) $5x - 3 \leq 7 - 3x$

(b) $|3x - 7| < 4$

(c) $(x - 1)^2 < 9$

(d) $\sqrt{x - 1} \geq 2$.

4 Trigonometry

Problem 9. Fill in the following table with *exact* values:

θ in degrees	θ in radians $0 \leq \theta < 2\pi$	$\sin \theta$	$\cos \theta$	$\tan \theta$
0°				
30°				
45°				
60°				
90°				
120°				
135°				
150°				
180°				
210°				
225°				
240°				
270°				
300°				
315°				
330°				

Problem 10. Find the exact values for the following expressions.

(a) $\tan \theta$ when θ is in the third quadrant and $\sin \theta = \frac{4}{5}$.

(b) $\sin \frac{\pi}{12}$. (Hint: remember your trig identities?)