

The below problems should give you a feel for the flavor of things that might be on the final, though obviously there are **way** more problems here than will be on the actual midterm. As always with these sorts of things, the inclusion or exclusion of certain topics from this list **should not be thought of as an indication of the contents of the actual exam**.

Moreover, this review sheet is meant as a supplement to, not a replacement for, the previous two review sheets and as such does not contain any problems from the first 2/3 of the course.

1. Evaluate each of the following.

- (a) $\sin \frac{7\pi}{4}$
- (b) $\tan \frac{-7\pi}{6}$
- (c) $\sin^{-1} \frac{-1}{2}$
- (d) $\cos(\cos^{-1} \frac{3}{7})$
- (e) $\cos^{-1}(\cos \frac{5\pi}{12})$
- (f) $\cos^{-1}(\cos \frac{16\pi}{7})$ (Hint: be careful!)

2. Problem 34 from 7.2

3. Sketch a graph of each of the following. Be sure to label all important features for at least one full period:

$$(a) y = 3 \sin(2x - \frac{\pi}{6}) \qquad (b) y = 2 \tan(\pi x - \frac{\pi}{2}) \qquad (c) y = -2 \cos\left(\frac{x}{2} - \frac{\pi}{6}\right)$$

4. Show that each of the following are identities:

$$(a) 1 + \cos 2\theta = \cot \theta \sin 2\theta \qquad (c) 2 \sin x + \sin 2x = \frac{2 \sin^3 x}{1 - \cos x} \qquad (d) \cos 2x = \frac{1 - \tan^2 x}{1 + \tan^2 x}$$

$$(b) \tan\left(\frac{s+t}{2}\right) = \frac{\sin s + \sin t}{\cos s + \cos t} \qquad (e) \frac{\cos 12x}{\sin 4x} + \frac{\sin 12x}{\cos 4x} = 2 \cot 8x$$

5. Find all real solutions to each of the following equations:

- (a) $2 \cos^2 x = \sqrt{3} + 2 \sin^2 x$
- (b) $2 \cos^2 x - \cos x - 1 = 0$
- (c) $e^{\sin x} = 2$
- (d) $\sin(2 \tan^{-1} x) = 1$
- (e) $\cos^2 x - \cos x - 1 = 0$

6. Solve each of the following systems of equations:

$$(a) \begin{cases} 2x + 3y - 4z = -4 \\ x - y + z = 5 \\ y + 3z = 11 \end{cases}$$

$$(b) \begin{cases} \sqrt{x} - y = 1 \\ \ln x - y = 0 \end{cases}$$

$$(c) \begin{cases} x^2 + y^2 = 5 \\ xy = 2 \end{cases}$$

7. Find the domain of $f(x) = \frac{\tan 2x}{\sin^{-1} x - \frac{\pi}{3}}$

8. Find all roots of each of the following polynomials:

- (a) $3x^4 - 8x^3 - 3x^2 + 12x + 4$
- (b) $x^5 - 5x^4 + 8x^3 - 9x + 5$
- (c) $2x^4 - 9x^3 + 8x^2 + 6x - 4$

9. Evaluate $f(3)$ where $f(x) = x^7 - x^6 - 9x^5 + 10x^4 - 5x^3 + 7x^2 - 8x + 15$