Math 130 - Review 3

November 3, 2019

Name _____

Score _____

These problems may help you review for Test 3. Your actual test will not be as long as this review packet. For other practice problems, refer to the suggested homework problems. When providing exact answers, simplify as much as possible. For each triangle described below, a is opposite α, b is opposite β, and c is opposite γ (unless otherwise indicated).

---

1. Write $165°$ as the sum or difference of two of our familiar unit-circle angles. Then use the appropriate sum or difference formula(s) to find the exact values of the sine, cosine, and tangent of $165°$. Do not use a calculator for this problem.

2. Repeat the problem above for $255°$.

3. Find the exact value of $\sin\frac{\pi}{12}\cos\frac{\pi}{4} + \cos\frac{\pi}{12}\sin\frac{\pi}{4}$. Do not use a calculator for this problem.

4. Suppose u and v are 3rd quadrant angles with $\sin u = -7/25$ and $\cos v = -4/5$. Find the exact values of $\cos(u - v)$, $\sin(u - v)$, and $\tan(u - v)$. Do not use a calculator for this problem.

5. Write $\cot(\theta - \pi)$ as a function of only θ. Do not use a calculator for this problem.

6. Find all solutions. Do not use a calculator.

   (a) $\sin(x + \pi) - \sin x + 1 = 0$

   (b) $\cos\left(x + \frac{\pi}{4}\right) - \cos\left(x - \frac{\pi}{4}\right) = 1$

7. Given that β is a 2nd quadrant angle with $\cos\beta = -4/5$, find the exact values of $\sin 2\beta$, $\cos 2\beta$, and $\tan 2\beta$. Do not use a calculator for this problem.

8. Given that u is a 1st quadrant angle with $\cos u = 7/25$, find the exact value of $\sin(u/2)$, $\cos(u/2)$, and $\tan(u/2)$. Do not use a calculator for this problem.

9. Use a product-to-sum formula to rewrite $7\cos(-5x)\,\sin 3x$.

10. Use a sum-to-product formula to rewrite $\cos x + \cos 4x$.

11. Find all solutions. Do not use a calculator.

(a) $\sin 2x - \sin x = 0$

(b) $\sin 6x + \sin 2x = 0$

(c) $\sin \dfrac{x}{2} + \cos x = 0$

12. Solve each triangle. Round to the nearest hundredth.

(a) $\alpha = 40°$, $\beta = 60°$, $b = 30$

(b) $\alpha = 138°$, $a = 210$, $b = 150$

(c) $\alpha = 35°$, $a = 4$, $b = 10$

(d) $\alpha = 27°$, $a = 5$, $c = 9$

13. In a hilly area, a distance of 120 feet was measured down the slope of a hill from the base of a tree. From this point, the angles of elevation to the top and base of the tree are 37° and 22°, respectively. How tall is the tree?

14. A fishing boat adrift at sea indicated its positions as 18 miles S 36° E from a coast guard station. A coast guard patrol boat indicated its position at 15 miles S 8° W of the coast guard station. How far apart are the boats?

15. Solve each triangle. Round to the nearest hundredth.

(a) $a = 10$, $b = 15$, $c = 20$

(b) $a = 10$, $b = 20$, $\gamma = 30^\circ$

16. Carry out the indicated operation. Write your result in standard form.

(a) $(5 + 3i) + (2 - i)^2$

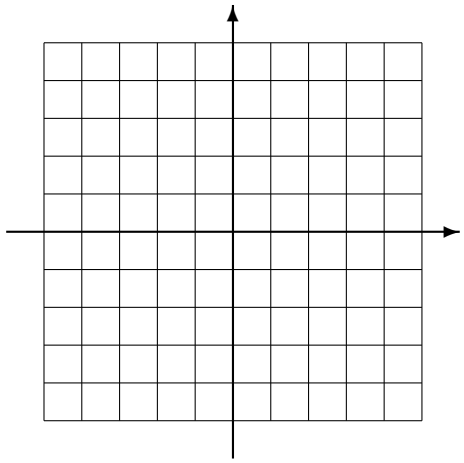
(b) $i^5 - i(3 - 6i)$

(c) $i(3 - 7i)(2 + 4i)$

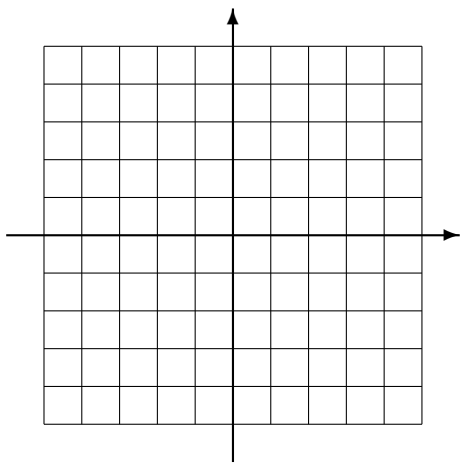
(d) $\dfrac{8 + 7i}{2i - 3}$

17. Plot, compute, and illustrate in the complex plane.

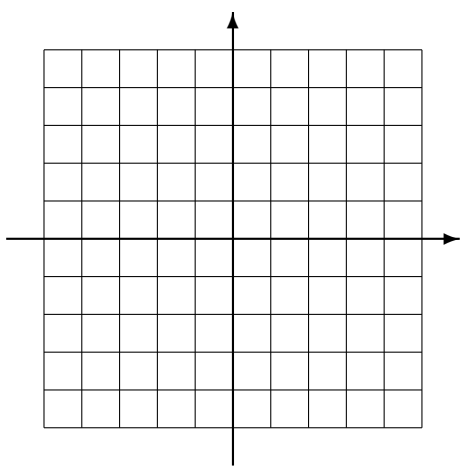
(a) $3i + (2 + 2i)$



(b) $(1 - 3i) + (1 + 3i)$



(c) $(4 + 2i) - (3 + i)$



18. Write in polar (trigonometric) form.

(a) $1 - \sqrt{3}\, i$

(b) $1 + i$

(c) $-5i$

(d) $-7 + 4i$

19. Find the product $z_1 z_2$ in polar (trigonometric) form.

(a) $z_1 = \dfrac{5}{3}(\cos 120^\circ + i \sin 120^\circ), \qquad z_2 = \dfrac{2}{3}(\cos 30^\circ + i \sin 30^\circ)$

(b) $z_1 = \dfrac{1}{2}(\cos 100^\circ + i \sin 100^\circ), \qquad z_2 = \dfrac{4}{5}(\cos 300^\circ + i \sin 300^\circ)$

20. Find the quotient z_1/z_2 in polar (trigonometric) form.

(a) $z_1 = 12(\cos 92^\circ + i \sin 92^\circ), \qquad z_2 = 2(\cos 122^\circ + i \sin 122^\circ)$

(b) $z_1 = 2(\cos \pi + i \sin \pi), \qquad z_2 = 3[\cos(\pi/3) + i \sin(\pi/3)]$

21. Write the complex numbers in polar form. Then find their product and quotient.

$$z_1 = \sqrt{3} + i, \qquad z_2 = 1 - i$$