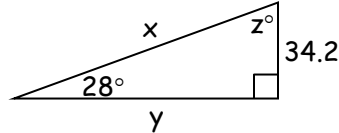


PRECALCULUS MIDTERM REVIEW:

I. TRIGONOMETRY

1. Find x , y and z to the nearest tenth:



2. Find the approximate values of:

- | | | |
|-----------------------------------|-----------------------------------|-----------------------------------|
| a) $\csc 48^\circ$ | b) $\cot 67^\circ$ | c) $\sec 21^\circ$ |
| d) $\operatorname{Arccsc}(-2.58)$ | e) $\operatorname{Arccot}(-2.45)$ | f) $\operatorname{Arcsec}(-7.82)$ |

3. Convert $-78^\circ 32' 16''$ to radian measure (nearest hundredth).

4. There are 10 small rollers under a conveyor belt and each roller has a radius of 12 cm. The rollers turn at a rate of 120 revolutions per minute. What is the linear velocity of the belt driving the rollers in cm per second?

5. How many solutions to the equation $-3\cos(3x) = -5\sin(4x) + 2$ lie on the interval $[0, 2\pi]$?

11. Find the reference \angle for the following:

- | | | | |
|-----------------|------------------|----------------------|------------------------|
| (a) 395° | (b) -138° | (c) $\frac{7\pi}{5}$ | (d) $-\frac{14\pi}{9}$ |
|-----------------|------------------|----------------------|------------------------|

12. Convert to radian measure: (a) 450° (b) -110°

13. Convert to degree measure: (a) $\frac{4\pi}{3}$ (b) $-\frac{7\pi}{18}$

14. State the domain and range of the following relations:

- | | | |
|----------------------------------|----------------------------------|----------------------------------|
| a) $y = \cos x$ | b) $y = \sin x$ | c) $y = \tan x$ |
| d) $y = \operatorname{Arccos} x$ | e) $y = \operatorname{Arcsin} x$ | f) $y = \operatorname{Arctan} x$ |

15. Find the length of the arc intercepted by a central angle of $\frac{2\pi}{3}$ if the radius of the circle is 36 m.

16. Express the 6 trig functions of $\theta = 135^\circ$ in terms of its reference angle.

17. θ is an angle in standard position and its terminal side is on the 4th quadrant. If $\tan \theta = -\frac{12}{5}$, find the exact value of the other 5 trig functions.

18. Find the exact value of \sin , \cos , and \tan of an angle θ in standard position if the point $(-4, 6)$ is on its terminal side.

19. Find one positive and one negative angle coterminal with: (a) 210° (b) $\frac{3\pi}{5}$

20. State the amplitude, period, and phase shift of the function $y = -5\sin 4\left(x + \frac{\pi}{4}\right)$.

21. Write an equation of the cosine function with amplitude 7, period 4π , and phase shift $\frac{\pi}{6}$ to the right.

22. Evaluate: (a) $\tan\left(\operatorname{Arc} \cos \frac{-\sqrt{2}}{2}\right)$ (b) $\cos[\operatorname{Tan}^{-1}(-1)]$ (c) $\sin\left(\operatorname{Tan}^{-1} \frac{-\sqrt{3}}{3} + \operatorname{Cos}^{-1} \frac{-1}{2}\right)$

23. Find the values of x in the interval $0 \leq x < 2\pi$ that satisfy the equation:

- | | | | |
|-----------------------------------|--------------------|-----------------|------------------------|
| a) $\cos x = \frac{-\sqrt{3}}{2}$ | b) $\tan x = (-1)$ | c) $\csc x = 2$ | d) $\cot x = \sqrt{3}$ |
|-----------------------------------|--------------------|-----------------|------------------------|

24. Use a half-angle identity to find the exact value of: (a) $\cos 67.5^\circ$ (b) $\sin 15^\circ$

25. For $0^\circ < x < 90^\circ$ and $90^\circ < y < 180^\circ$, if $\sin x = \frac{5}{13}$ and $\tan y = -\frac{7}{24}$, find the value of:

- | | | |
|------------------|------------------|------------------|
| a) $\cos(x - y)$ | b) $\sin(x + y)$ | c) $\tan(x - y)$ |
|------------------|------------------|------------------|

Polynomials & Functions :

- Find the zeros of $f(x) = x^4 - 2x^3 + 2x - 1$.
- Factor $4x^4 - 24x^3 + 35x^2 + 6x - 9$.
- Sketch the graph of a cubic, quadratic, linear, and quartic functions.
- Solve for x : $0 = x^4 - 4x^2 - 12$.
- Describe the transformations of the graph of the given function $f(x)$:

a. $k \cdot f(x)$	b. $f(x) + k$	c. $f(x - k)$
d. $-f(x)$	e. $f(-x)$	f. $ f(-x) $
- How many real zeros does the function $f(x) = 3x^4 - x^3 + 4x^2 - 2x - 4$ have? Find them.
- How do you determine between which two consecutive integers an irrational zero must lie?
- How do you determine the symmetry with respect to:

a. x-axis	b. y-axis	c. origin	d. line $y = x$
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- How do you tell if the graph of a function is tangent to the x-axis?
- Solve: $6400 = 2x^2 + 40x$.
- Write the polynomial with integral coefficients of lowest possible degree and with zeros 4 and $3i$.
- What is the remainder when $f(x) = x^{101} - 3x^{50} + 6$ is divided by $(x + 1)$?
- A rectangular enclosure is to be made using a barn as one side and 80 m of fencing to form the other three sides. What is the maximum area of such an enclosure?
- If $f(x) = \sqrt{x-1}$ and $g(x) = x^2 + 1$, what is the domain of $g(f(x))$?

a) all real numbers	b) $\{x \mid x \geq 1\}$	c) $\{x \mid x \leq 1\}$	d) $\{x \mid x < 1\}$	e) $\{x \mid x > 1\}$
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16. If $f(x) = x^2 - 1$ and $f(g(x)) = x^2$, find $g(x)$.

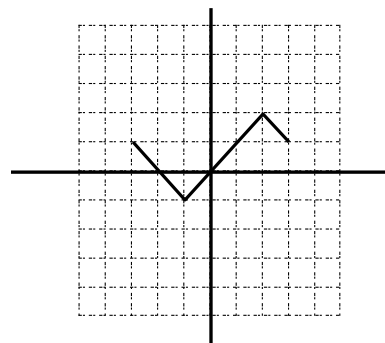
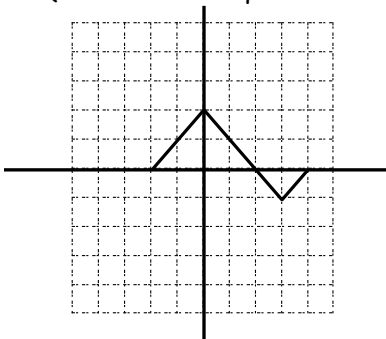
- | | | | | |
|-------|-----------------|---------------|------|-------------------|
| a) -1 | b) $\sqrt{x+1}$ | c) $2x^2 + 1$ | d) 1 | e) $\sqrt{1+x^2}$ |
|-------|-----------------|---------------|------|-------------------|

17. The domain for the function $f(x) = \sqrt{4x - x^2}$ is:

- | | | |
|------------------------------|-------------------------|-----------------------|
| a) $x \leq 0$ or $x \geq 4$ | b) $0 \leq x \leq 4$ | c) $-4 \leq x \leq 0$ |
| d) $x \leq 0$ and $x \geq 4$ | e) $x \in \text{Reals}$ | |

18. The graph of $y = f(x)$ is pictured on the left. Which of the following functions best describes the graph on the right?

(Assume each square is one unit.)



- | | | |
|----------------------|----------------------|----------------------|
| a) $y = -f(x+1) + 1$ | b) $y = -f(x-1) + 1$ | c) $y = f(-x+1) + 1$ |
| d) $y = -f(x-1) - 1$ | e) $y = -f(x+1) - 1$ | |

19. If $f(x) = \frac{x+6}{x}$ and $f^{-1}(x)$ is the inverse of $f(x)$, then $f^{-1}(2) = ?$

- | | | | | |
|------|------|------|------|--------------------|
| a) 2 | b) 4 | c) 6 | d) 8 | e) can't determine |
|------|------|------|------|--------------------|

Key: TRIGONOMETRY

1. $x = 72.8$, $y = 64.3$, $z = 62^\circ$
2. a) 1.3 b) 0.4 c) 1.1
d) -22.8° e) 157.8° f) 97.3°
3. -1.37 radians
4. 150.8 cm/sec
5. 8
6. $-2 \text{ cis } 16^\circ$ **Ignore # 6 - 10**
 $-2 \text{ cis } 88^\circ$
 $-2 \text{ cis } 160^\circ$
 $-2 \text{ cis } 232^\circ$
 $-2 \text{ cis } 304^\circ$
7. a) 36
b) 2695.93
c) 108.36
8. 89.6
9. a) 1
b) 0

c) 2
d) 2
10. a) 24.6
b) 115° or 65°
c) 14
d) 48°
11. a) 35° b) 42° c) $\frac{2\pi}{5}$
d) $\frac{4\pi}{9}$
12. a) $\frac{5\pi}{2}$ b) $\frac{-11\pi}{18}$
13. a) 240° b) -70°
14. a) $D = \{x | x \text{ is a real number}\}$ $R = \{y | -1 \leq y \leq 1\}$
b) $D = \{x | x \text{ is a real number}\}$ $R = \{y | -1 \leq y \leq 1\}$
c) $D = \{x | x \in \text{Real}, x \neq \frac{1}{2}\pi + \pi n, \text{ where } n \in \text{Integer}\}$
 $R = \{y | y \text{ is a real number}\}$
d) $D = \{x | -1 \leq x \leq 1\}$ $R = \{y | 0^\circ \leq y \leq 180^\circ\}$
e) $D = \{x | -1 \leq x \leq 1\}$ $R = \{y | -90^\circ \leq y \leq 90^\circ\}$
f) $D = \{x | x \text{ is a real number}\}$ $R = \{y | -90^\circ < y < 90^\circ\}$
15. 24π
16. $\sin 135^\circ = \sin 45^\circ$, $\cos 135^\circ = -\cos 45^\circ$, $\tan 135^\circ = -\tan 45^\circ$
 $\csc 135^\circ = \csc 45^\circ$, $\sec 135^\circ = -\sec 45^\circ$, $\cot 135^\circ = -\cot 45^\circ$
17. $\sin \theta = -12/13$, $\cos \theta = 5/13$, $\csc \theta = -13/12$,
 $\sec \theta = 13/5$, $\cot \theta = -5/12$
18. $\sin \theta = \frac{3\sqrt{13}}{13}$, $\cos \theta = \frac{-2\sqrt{13}}{13}$, $\tan \theta = \frac{-3}{4}$
19. a) $570^\circ, -150^\circ$ b) $13\pi/5, -7\pi/5$
20. $A = 5$, $P = \pi/2$, P.S. = $\pi/4$ left
21. $y = 7 \cos \frac{1}{2} \left(x - \frac{\pi}{6} \right)$
22. a) -1 b) $\frac{\sqrt{2}}{2}$ c) 1
23. a) $5\pi/6, 7\pi/6$ b) $3\pi/4, 7\pi/4$
c) $\pi/6, 5\pi/6$ d) $\pi/6, 7\pi/6$
24. a) $\frac{\sqrt{2-\sqrt{2}}}{2}$ b) $\frac{\sqrt{2-\sqrt{3}}}{2}$
25. a) $-\frac{253}{325}$ b) $-\frac{36}{325}$ c) $\frac{204}{253}$

Polynomials and Functions:

- 1) 1 (TR), -1 2) $(x-3)^2(2x+1)(2x-1)$ 3) (graphs) 4) $\pm\sqrt{6}, \pm i\sqrt{2}$
- 5) (will discuss in class) 6) 1, -2/3 7) if $f(a)$ and $f(b)$ have opposite signs
- 8) (will discuss in class)
- 9) graph will be tangent to the x-axis at its double-root, quadruple root, or any even-numbered root
- 10) $(0, -3)$ 11) $-10 \pm 10\sqrt{33}$ 12) $x^3 - 4x^2 + 9x - 36$
- 13) 2 14) 800 m^2 15) B
- 16) E 17) B 18) A
- 19) C