Basic Skills (4 points each)

1. Expand and simplify $(3 - 2\sqrt{5})^2$.

    A) $23 - 4\sqrt{5}$ B) $29 - 4\sqrt{5}$ C) $29 - 12\sqrt{5}$ D) $23 + 12\sqrt{5}$

2. Expand and simplify $(4 + i\sqrt{3})^2$

    A) $13 - 5i\sqrt{3}$ B) $19 + 8i\sqrt{3}$ C) $8 - 8i\sqrt{3}$ D) $13 + 8i\sqrt{3}$

3. $\log_2\left(\dfrac{1}{16}\right)$ equals

    A) $1/4$ B) $-1/4$ C) 4 D) -4

4. Determine b if $\log_b(64) = -3$.

    A) $1/4$ B) $-1/4$ C) 4 D) -4

5. The vertical asymptotes of the graph of the rational function $f(x) = \dfrac{3x^2 + x - 1}{x^2 - 2x - 15}$ are

A) $x = 3$ B) $x = 5$, $x = -2$ C) $x = -5$, $x = 2$ D) $x = 0$, $x = 15/2$

6. Convert $225°$ to radians.

A) $7\pi/12$ B) $5\pi/4$ C) $5\pi/8$ D) $5\pi/12$

7. Convert $\dfrac{7\pi}{12}$ to degrees

A) $105°$ B) $75°$ C) $210°$ D) $225°$

8. $\sin(105°)$ equals

A) $\dfrac{\sqrt{6} + \sqrt{2}}{2}$ B) $\dfrac{\sqrt{6} + \sqrt{2}}{4}$ C) $\dfrac{\sqrt{6} - \sqrt{2}}{2}$ D) $\dfrac{\sqrt{6} - \sqrt{2}}{4}$

9. $\sec\left(\tan^{-1}\left(\frac{7}{12}\right)\right)$ in $[0, \pi/2]$ equals

A) $\dfrac{5}{12}$ 　　　B) $\dfrac{\sqrt{193}}{12}$ 　　　C) $\dfrac{\sqrt{95}}{7}$ 　　　D) $\dfrac{\sqrt{193}}{12}$

10. $\cos\left(\sin^{-1}\left(\frac{4}{9}\right)\right)$ in $[\pi/2, \pi]$ equals

A) $-\dfrac{\sqrt{5}}{9}$ 　　　B) $-\dfrac{\sqrt{65}}{9}$ 　　　C) $\dfrac{9}{\sqrt{97}}$ 　　　D) $-\dfrac{9}{\sqrt{97}}$

11. Change $\left(8, \dfrac{\pi}{6}\right)$ from polar coordinates to rectangular coordinates.

A) $(4, 4\sqrt{3})$ 　　　B) $(8, 8\sqrt{3})$ 　　　C) $(4\sqrt{3}, 4)$ 　　　D) $(4, 4\sqrt{3})$

12. Change $(-6, 6)$ from rectangular coordinates to polar coordinates.

A) $(6, \pi/4)$ 　　　B) $(6\sqrt{2}, 3\pi/4)$ 　　　C) $(6, 3\pi/4)$ 　　　D) $(-6\sqrt{2}, 5\pi/4)$

13. If $\mathbf{u}=(-3,2)$ and $\mathbf{v}=(4,5)$, then $3\mathbf{u}+4\mathbf{v}$ equals

    A) $(25,26)$ B) -24 C) $(7,26)$ D) $(-7,26)$

14. If $\mathbf{w}=(4,9)$, then $|\mathbf{w}|$ equals

    A) 13   B) $\sqrt{65}$ C) 5   D) $\sqrt{97}$

15. Match the given equation with the type of conic:

    _____ $x^2 + 3y^2 = 8$ A. CIRCLE

    _____ $y = 3(x-1)^2 + 2$ B. ELLIPSE

    _____ $3x^2 - y^2 = 1$ C. PARABOLA

    _____ $x^2 + (y-1)^2 = 8$ D. HYPERBOLA

More Skills (Non-multiple choice - 5 points each)

16. In the triangle ABC, $\angle A = 30°$, $\angle B = 45°$, A=32. Determine B.

17. In the triangle ABC, A=10, B=8, $\angle C = 60°$. Determine C.

18. If $\mathbf{u}=(b, 5)$ and $\mathbf{v}=(b, -2)$, determine b so that the vectors $\mathbf{u}$ and $\mathbf{v}$ are perpendicular.

19. Determine the equation of the line which passes through the point $P(2, 40)$ and is perpendicular to $x + 2y = 8$.

20. If $\ln(a) = 1.5$, $\ln(b) = 6$, and $\ln(c) = -2$, determine $\ln\left(\dfrac{ab^2}{\sqrt{c}}\right)$

21. Write as a single logarithm $2\ln(3) - 5\ln(2) + 6\ln(1)$

22. If vector $\mathbf{u}=(2,3)$ and vector $\mathbf{v}=(5,1)$, determine the angle between them.

23. If $f(x) = x^2 - 3x + 5$ determine $\dfrac{f(2+h) - f(2)}{h}$ and simplify as much as possible.

The following questions are worth 10 points each

24. Give the inverse of the function $f(x) = \dfrac{2x+1}{4x-7}$

25. Give the inverse of the function $f(x) = 5\ln\left(\dfrac{x-1}{2}\right)$

26. Give the center and radius of the circle $x^2 + y^2 + 6x - 5y + 3 = 0$

27. (8 pts) Divide and give the quotient in the space provided.

$$\frac{3x^4 + 2x^3 - x^2 + 4x - 68}{x - 2}$$

_____

28. $1000 is deposited at 6% annual interest compounded semi-annually, (twice a year). In how many years will the investment double? (Leave your answer as $t = $)

29. If $\sin\theta = \frac{4}{9}$ and $\frac{\pi}{2} \leq x \leq \pi$, determine:

(a) $\sin(2\theta)=$_____

(b) $\cos(2\theta)=$_____

30. Sketch the graph of $y = 5 + 10\cos\left(\frac{\pi x}{2}\right)$. Label each x-intercept and label each of the points (x, y) where the function reaches its highest and lowest values.

31. Solve $\log_2(x) + \log_2(x + 6) = 4$

32. If $f(x) = 2x^2 - 5x - 3$, determine the vertex and x-intercepts.

vertex = _____

x-intercepts = _____

33. Determine the exact value of $z = (2 + 2i)^4$