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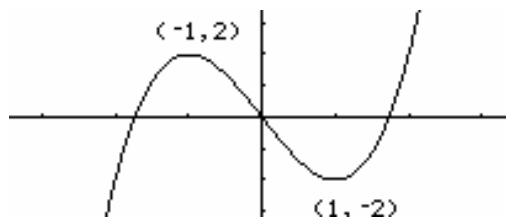
1.(3) The graph of $f(x) = x^3 - 3x$ is shown in the following figure. Determine the open intervals on which $f(x)$ is increasing, decreasing, or constant.


2.(4) Find all real zeros of $f(x) = x^3 - x^2 - 2x$

3.(4) Divide $f(x) = 6x^3 - 19x^2 + 16x - 4$ by $x - 2$, and use the result to factor the function completely.

4.(4) Given the rational function $f(x) = \dfrac{1}{x+2}$; check for intercepts, symmetry, vertical asymptotes, horizontal asymptotes, and sketch its graph.

6.(4) a.) Find an angle θ that is coterminal to $\dfrac{11\pi}{4}$ such that $0 \le \theta \le 2\pi$.

b.) Find an angle θ that is coterminal to $-423°$ such that $0 \le \theta \le 360°$.

c.) What is the angle that is supplementary to $\theta = \dfrac{\pi}{15}$.

d.) Convert to radians: $330°$. (Write your answer as a multiple of π.)

7.(4) Find the point (x, y) on the unit circle that corresponds to the real number $t = \dfrac{4\pi}{3}$.

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8.(4)   Give the exact value of:

(a) $\cos\left[-\dfrac{\pi}{6}\right]$ (b) $\sin\dfrac{7\pi}{6}$ (c) $\tan\left[-\dfrac{3\pi}{4}\right]$

9.(4) In the triangle shown below, find the exact value of $\tan\theta$.

Box Answers!
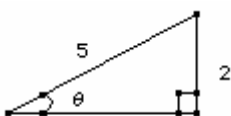
10.(3) Determine the exact value of $\cos\theta$, if θ is in standard position and its terminal side passes
        through the point $(-3, 3)$.

11.(3) Find the reference angle for $\theta = -155°$.

Box Answers!

12.(4) Solve for θ, $(0 \le \theta < 2\pi)$:

(a) $\cos\theta = \dfrac{\sqrt{2}}{2}$ (b) $\sin\theta = -\dfrac{\sqrt{3}}{2}$

13.(4) Determine the period and amplitude of the following functions:

(a) $f(x) = -7\cos 3x$ (b) $f(x) = 5\cos\dfrac{x}{2}$

14.(4) Evaluate:

(a) $\arcsin\left[-\dfrac{\sqrt{2}}{2}\right]$ (b) $\arcsin\left[-\dfrac{\sqrt{3}}{2}\right]$ (c) $\arctan\dfrac{\sqrt{3}}{3}$

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PART B

1.(4)   Find the domain of each function.

(a) $f : \{(-3,0),(-1,4),(0,2),(2,2),(4,-1)\}$ (b) $h(x) = \dfrac{1}{x+5}$ (c) $k(x) = \sqrt{4-3x}$

2.(4) For $f(x) = -2x + 4$, find $\dfrac{f(x+h) - f(x)}{h}$ (A Difference Quotient)

3.(4)   Given $f(x) = x + 2$ and $g(x) = 4 - x^2$, evaluate $f(g(x))$ when $x = 0, 1, \text{ and } 2$.

4.(5)   Find a polynomial function with integer coefficients that has the following four zeros. (There are many correct answers.) $0, 0, 4, 1 + \sqrt{2}\, i$

5.(4)   A certain population decreases according to the equation $y = 300 - 5e^{0.2t}$. Find the initial population and the population (to the nearest integer) when $t = 10$.

6.(4) Write in logarithmic form: $3^5 = 243$.

7.(4)   Write as the logarithm of a single quantity: $\frac{1}{5}[\, 3 \log(x+1) + 2 \log(x-1) - \log 7\,]$.

8.(4)   Solve for x: $\log x + \log(x+3) = 1$.   Show work.

9.(5)   A total of $12,000 is invested at an annual rate of 9% . Find the balance after 6 years if it is compounded

(a) quarterly.   (b) monthly.   (c) continuously.

(Show formulas and calculations.)

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10.(4) A central angle θ of a circle with radius 9 inches intercepts an arc 20 inches. Find θ in decimal degrees and in radians. Show the calculation.

Box Answers!

11.(4)   Use a calculator to find the value of $\cot 49°$. Round your answer to four decimal places and show the calculation or function used on the calculator.

12.(4)   Use a calculator to find θ such that $0 \le \theta < \dfrac{\pi}{2}$ and $\csc \theta = 1.4736$.

13.(4) Find x for the right triangle shown below. Show the calculation.
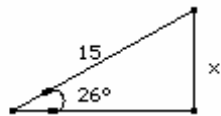
14.(4) A man that is 6 feet tall casts a shadow 14 feet long. Find the angle of elevation of the sun. Show the calculation used.

15.(5)   An airplane leaves the runway climbing at 18° with a speed of 275 feet per second. Find the altitude of the plane after 1 minute. Show the calculation.

16.(4)   Use a calculator to evaluate: $\arctan(-3)$. Round your answer to four decimal places.

17.(4)   Use an inverse trigonometric function to write θ as a function of x.

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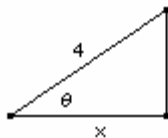
23.(4) Simplify: $\sin^2 x \cdot \cot^2 x + \sin^2 x$. Show work; justify answer.

24.(4)   Simplify the expression so that it is not in fractional form: $\dfrac{\cos^2 x}{1 - \sin x}$. Use a graphing utility to verify your result. Sketch the graph.

25.(4)   Find all solutions in the interval $[0, 2\pi)$: $2\sin^2 x = \sin x$.

26.(4) Given a triangle with $A = 102°$, $B = 23°$,   *and* $c = 576.1$,   *find* a.

27.(4)   Given a triangle with $a = 135$, $b = 71.6$,   *and* $c = 69$,   *find* B.

28. (4)   Find the determinant of $\begin{vmatrix} x^y & 2 \\ 3 & x^{2y} \end{vmatrix}$