1. Calculate each by using long division. a) $(x^3-2x+1)\div(x-4)$ *b)* $\left(x^3+2x^2-6x+1\right)\div(x+2)$
   [$x^2+4x+14$ R57, x^2-6 R13]

2. Use synthetic division to divide a) $(3x^3-5x^2-7x-1)\,by\,(x-3)$ *b)* $12x^3+2x^2+11x+16\ by\ 3x+2$
   [$3x^2+4x+5$ *R*14 , $12x^2-6x+15$ *R*6]

3. Factor a) $x^3+6x^2+11x+6$ *b)* $6x^3-17x^2+6x+8$ *c)* x^3+8 *d)* $27m^6-8n^3$
   [$(x+1)(x+2)(x+3)$, $(x-2)(3x-4)(2x+1)$, $(x+2)(x^2-2x+4)$, $(3m^2-2n)(9m^4+6m^2n+4n^2)$]

4. $x+2$ is a factor of $x^3+x^2-kx-24$. Determine the value of *k*. [14]

5. Solve $2x^3+3x^2-5x-6=0$ b) $3x^3+x^2+12x+4=0$ [$-2,\frac{3}{2},-1;\ \frac{-1}{3},\pm 2i$]

6. Determine an equation of a cubic function that has roots of -2 and $-1+i$. [$x^3+4x^2+6x+4=0$]

7. i)Sketch $y=x^3-7x^2+4x+12$ by determining all intercepts and end behaviours. [Graphing App]
   ii) Solve $x^3-4x^2-3x+18\le 0$ [$x\le -2,\ x=3$]

8. Sketch *a)* $y=4^{-x}$ *b)* $y=\log_3 x$ *c)* $y=\log_2 x-1$ *d)* $y=\log_2(x+3)$ [Graphing App]

9. State the Domain and Range for each graph from #8.
   [$D=\{x\in R\}, R=\{y\in R, y>0\}; D=\{x\in R, x>0\}, R=\{y\in R\}$]
   [$D=\{x\in R, x>0\}, R=\{y\in R\}; D=\{x\in R, x>-4\}, R=\{y\in R\}$]

10. Evaluate *a)* $\log_3 81$ *b)* $\log_7\sqrt{7}$ *c)* $\log_3\left(\sqrt{3}\right)^3$ *d)* $\log_5\left(\frac{1}{125}\right)$ [4, 0.5, 1.5, –3]

11. Solve for *x*: (State any restrictions)
    a) $\log_x 64=-3$ *b)* $\log_{\sqrt{2}} 32=x$ *c)* $4^{x+1}=18$ *d)* $3(5)^{2x-1}=90$
    e) $\log_9(x-5)+\log_9(x+3)=1$ *f)* $2\log m+4\log m=12$
    [$\frac{1}{4}, 10, \frac{\log 18}{\log 4}-1, \frac{\log 30+\log 5}{2\log 5}, 6, 100$]

12. Express as a single log. $3\log_4 x+5\log_4 x-2\log_4 x$ [$\log_4 x^6$]

13. If $\log_4 x=0.6$ evaluate $\log_4\left(x^3\sqrt{x}\right)$ [$\frac{21}{10}$]

14. Initially there are 500 bacteria. After 8 minutes there are 3400. Estimate the doubling period. [2.89mins]

15. After 10 days 80% of a material has decayed. What is the half-life of the material? [4.3 days]

16. Express 135^o as an exact radian. Express 218° as an approximate radian measure. [$\frac{3\pi}{4}$, 3.8]

17. Express each as angle in degrees. *a*) $\frac{7\pi}{4}$ *b*) $\frac{2\pi}{5}$ *c*) $2.8\,radians$ $[315^\circ, 72^\circ, 160.5^\circ]$

18. Evaluate as an exact measure. *a*) $\tan 225$ *b*) $\cos\frac{2\pi}{3}$ *c*) $\sin\frac{5\pi}{3}$ *d*) $\sec\frac{7\pi}{6}$ $[1, -0.5, \frac{-\sqrt{3}}{2}, \frac{-2\sqrt{3}}{3}]$

19. Solve for θ. $0 \le \theta \le 2\pi$

a) $\tan\theta = 1$ *b*) $2\sin\theta + \sqrt{3} = 0$ *c*) $\csc\theta = 2$ *d*) $\cos 2\theta = 1$

e) $2\cos^2\theta - 3\cos\theta + 1 = 0$ *f*) $3\sin^2\theta - 5\sin\theta + 2 = 0$ *g*) $3\tan^2 2\theta - 1 = 0$

$[\frac{\pi}{4}, \frac{5\pi}{4};\ \frac{4\pi}{3}, \frac{5\pi}{3};\ \frac{\pi}{6}, \frac{5\pi}{6};\ 0, \pi, 2\pi;\ 0, \frac{\pi}{3}, \frac{5\pi}{3}, 2\pi;\ 0.73^r, 2.41^r, \frac{\pi}{2};]$

$[\frac{\pi}{12}, \frac{5\pi}{12}, \frac{7\pi}{12}, \frac{11\pi}{12}, \frac{13\pi}{12}, \frac{17\pi}{12}, \frac{19\pi}{12}, \frac{23\pi}{12}]$

20. Graph one complete cycle.

a) $y = \tan x$ *b*) $y = -2\sin 3(x - \frac{\pi}{4})$ *c*) $y = \cos(\frac{1}{2}x + \frac{\pi}{4}) + 1$ [Graphing App]

21. If $\cos x = \frac{5}{13}$ *and* $\sin y = \frac{3}{5}$ *where* $0 \le x, y \le \frac{\pi}{2}$ determine

a) $\cos(x + y)$ b) $\sin(x - y)$ *c*) $\sin 2x$ *d*) $\cos 2y$ $[\frac{-16}{65}, \frac{33}{65}, \frac{120}{169}, \frac{7}{25}]$

22. Simplify (double angle formulas) a) cos3xcos2x + sin3xsin2x b) $2\cos^2\frac{\pi}{6} - 1$ *c*) $1 - 2\sin^2\frac{\pi}{12}$

$[\cos x, \cos\frac{\pi}{3}, \cos\frac{\pi}{6}]$

23. Use compound angle formulas to evaluate

a) $\cos\frac{\pi}{12}$ *b*) $\sin\frac{7\pi}{12}$ *c*) $\tan\frac{5\pi}{12}$ *d*) $\sin\frac{11\pi}{12}$ $[\frac{\sqrt{2}+\sqrt{6}}{4}, \frac{\sqrt{2}+\sqrt{6}}{4}, \sqrt{3}+2, \frac{\sqrt{6}-\sqrt{2}}{4}]$

24. Use double angle formulas to evaluate exact measures of *a*) $\sin\frac{\pi}{12}$ *b*) $\cos\frac{3\pi}{8}$

$[\frac{\sqrt{2-\sqrt{3}}}{2}; \sqrt{\frac{-1+\sqrt{2}}{2\sqrt{2}}}]$

25. A Ferris Wheel has a radius of 20 m and its centre is 21.5 m above the ground. It rotates once every 30 seconds. Suppose a person gets on the ride at the bottom of the wheel at *t*=0.

i) Sketch a sinusoidal curve to represent the information given [Graphing App]

ii) Write an equation for the function you have sketched $[y = 20\sin\frac{\pi}{15}(\theta - 7.5) + 21.5]$

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27. Solve each trig identity.

a) $\cos^4 x - \sin^4 x = \cos 2x$ *b*) $\cos 4x = \cos^2 2x - \sin^2 2x$ *c*) $\sec 2x = \frac{\sec^2 x}{2 - \sec^2 x}$

d) $\sec 2x = \frac{1 + \tan^2 x}{1 - \tan^2 x}$ *e*) $\frac{\cot x - \tan x}{\cot x + \tan x} = \cos 2x$

28. Completely analyze each rational function and then sketch. You must be able to state all asymptotes (vert, horiz, obliq), intercepts (x and y), domain and behaviours (end and approaching asymptotes)

a) $y = \dfrac{x+1}{x^2+2x-15}$ *b)* $y = \dfrac{2x-1}{x+4}$ *c)* $y = \dfrac{x^2+6x+8}{x-3}$ *d)* $y = \dfrac{x^2-16}{x+4}$

[a) *As* $x \to -5^-$, $y \to -\infty$, *As* $x \to -5^+$, $y \to \infty$, *As* $x \to 3^+$, $y \to \infty$, *As* $x \to 3^-$, $y \to -\infty$]

29. Determine the average rate of change for

a) $f(x) = x^3 - x$ *from* $x = -1$ *to* $x = 3$ *b)* $f(x) = 2^{x-3}$ *from* $x = 2$ *to* $x = 5$

c) $f(x) = \cos x$ *from* $x = \dfrac{\pi}{3}$ *to* $x = \dfrac{\pi}{2}$ $[6, \dfrac{7}{6}, \dfrac{-3}{\pi}]$

29.5 Evaluate: a) 2+3 b) 4×3 c) $24 \div 4$ (I thought you could use an easy question by now)

30. Determine an estimate for the instantaneous rate of change for [0.2884, 12]

a) $f(x) = \sqrt{x}$ *at* $x = 3$ *b)* $f(x) = x^3 + 1$ *at* $x = -2$

31. Given $f(x) = 2x^2 + x$ *and* $g(x) = x + 1$ determine a) *f(g(x))* b) *g(f(x))* c) *g(g(x))*

[$2x^2 + 5x + 3$, $2x^2 + x + 1$, $x + 2$]

32. Given $f(x) = 3x$, $g(x) = x^2$, $h(x) = \sin x$ *and* $k(x) = \cos x$ determine whether each of the following is even, odd, or neither

a) $g(x)$ *b)* $k(x)$ *c)* $f(g(x))$ *d)* $f(h(x))$ *e)* $k(k(x))$ f) $f(x) \times h(x)$

[even, even, even, odd, even, even]

33. Given $f(x) = x + 2$, $g(x) = x - 4$, $h(x) = x^2 - 1$ graph each of the following:

a) $f + g$ *b)* $g + h$ *c)* $h - f$ *d)* $f \times g$ [Graphing App]

34. The Haddaway family van is all set for another fun filled family vacation. Of course Mr Haddaway has calculated some costs associated with the trip. By traveling at a constant (and safe) speed the Haddaway clan will minimize cost and maximize fun. The distance traveled is represented by d(t) = 90t where d is distance in kms and t is time in hours. The cost of gasoline is estimated by C(d) = 0.12d where is the cost in dollars.
Determine C(d(7)) and explain the meaning of C(d(7)).

[$75.60, represents the cost of a family fun filled vacation (fuel only) that includes a 7 hour trip]