EMT111 - Practice Problems III

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1. Find the domain and range for :
   (a) $f(x) = \sqrt{4 - x^2}$
   (b) $f(x) = 9 - x^2$
   (c) $f(x) = \frac{5x}{x-8}$
   (d) $f(x) = 5 + \sqrt{9 - x}$
2. If $f(x) = x^2 + 2x$ and $g(x) = 2x - 5$.Find the following:
   (a) $(f \circ g)(x)$
   (b) $g \circ f$
   (c) a function h such that $(g \circ h)(x) = x$
   (d) functions p and q such that $g(x) = p \circ q$
3. Find the vertex of the parabola $y = 2x^2 - 8x + 7$.
4. Find the minimum value of the function $f(x) = 2x^2 + 2x + 5$.
5. Show whether or not the function $f(x) = 5x^3 + 9$ is one-to-one.
6. Is $f(x) = x^2 - 6x + 11$ one-to-one? Explain.
7. Find the inverse of the following.
   (a) $f(x) = 5x - 8$
   (b) $f(x) = 2x^3 - 5$
   (c) $f(x) = \frac{x+2}{x-3}$

8. Solve.

   (a) $x^2 - 2x - 3 > 0$

   (b) $\frac{x^2-2x-24}{x^2-8x-20} \geq 0$

   (c) $x^4 - x^3 - 6x^2 < 0$

   (d) $\frac{2x^3-6x}{x^2+1} > 0$

   (e) $\frac{x}{x-4} < \frac{x-5}{x+1}$

9. Solve.

   (a) $\ln x + \ln(x+2) = \ln(x+6)$

   (b) $\log_3(2x-7) = 2$

   (c) $(\ln x)^2 = \ln x^4$

   (d) $\log_3(x+5) - \log_3(x-7) = 2$

10. Find $\tan\theta$ if $\sin\theta = 24/25$ and θ is in quadrant II.

11. Find the following .

    (a) $\sin\frac{11\pi}{6}$

    (b) $\cos\frac{4\pi}{3}$

    (c) $\tan\frac{3\pi}{4}$

12. Find $\cot\theta$ if $\sec\theta = 25/7$ and $\frac{3\pi}{2} < \theta < 2\pi$.

13. Find $\cos 2\theta$ if $\cos\theta = 4/7$.

14. Simplify.

    (a) $(\sin\theta + \cos\theta)^2$

    (b) $(\csc\theta - \cot\theta)(\csc\theta + \cot\theta)$

    (c) $(\sin\frac{\theta}{2} + \cos\frac{\theta}{2})^2$

    (d) $\sqrt{x^2+4}$ for $x = 2\tan\theta$ with $\frac{\pi}{2} < \theta < \frac{\pi}{2}$

15. Show that $\frac{\cos^2\theta}{\sin\theta} = \csc\theta - \sin\theta$.

16. Show that $\tan\theta + \cot\theta = \sec\theta\csc\theta$.

17. Find the following using a sum or difference formula.
   (a) $\sin 75^o$
   (b) $\cos 15^o$
   (c) $\cos 105^o$
18. Find $\sin 15^o$ using a half-angle formula.
19. Show that $\tan(A+B) = \frac{\tan A+\tan B}{1-\tan A \tan B}$ by using $\sin(A+B)$ and $\cos(A+B)$.
20. Sketch the following on graph paper:
   (a) $f(x) = x^2 - x - 12$
   (b) $f(x) = (x-3)^2 + 1$
   (c) $f(x) = \frac{1}{x+2} - 3$
   (d) $f(x) = 1 - 2\sin(x - \pi)$