Review problems - Worksheet

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1. Simplify

   (a)
   $$\left(\frac{27}{8}\right)^{-\frac{2}{3}}$$

   (b)
   $$\left(\frac{\frac{1}{x^2}}{y^5}\right)^{\frac{1}{2}}$$

   (c)
   $$\left(\frac{\frac{a^{-1/2}}{\sqrt{b}}}{\frac{3}{a}}\right)^2$$

   (d)
   $$\left(-\frac{15x^{8/3}}{18x^{-1/3}}\right)$$

   (e)
   $$\left(-\frac{10xy^5}{25x^{1/3}y^{-2}}\right)$$

2. Factor the following polynomials

   (a)
   $$-x^2+x+2$$

   (b)
   $$x^3+5x^2+6x$$

   (c)
   $$3x^2-2x+1$$

3. Find the center and radius of

   (a)
   $$(x+2)^2+y^2+2y+1=1$$

(b)

$$x^2 + y^2 + 2x - 4y + 1 = 0$$

4. Evaluate/Solve

(a)

$$ln(0)$$

(b)

$$\log(x - 3) = 4$$

(c)

$$6^x = 2^{x-1}$$

(d)

$$e^{3 \ln 2}$$

(e)

$$\ln(x + 1) = 3$$

(f)

$$2^x = 4^{x-1}$$

(g)

$$\log(x - 1) = \log(x) + \log(2x - 1)$$

(h)

$$\ln(e^{\ln x})$$

(i)

$$\log_x(4) = 2$$

5. Which quadrant is the angle in? What are these angles in radians/degrees.

   (a) $-\pi/6$
   (b) $\pi/3$
   (c) $-2\pi/3$
   (d) $-30°$
   (e) $45°$

6. Solve/Find:

   (a) $\sin(x) = 1/2$, for $x \in [\pi/2, 3\pi/2]$
   (b) $\cos(\alpha) =?$ if $\sin(\alpha) = \sqrt{3}/2$
   (c) $\sin(7\pi/6) =?$
   (d) $\cos(\pi/12) =?$
   (e) $\cos^{-1}(0) =?$
   (f) $\tan(x) = -1$

7. Solve the trig equations:
   (a) Find all x such that
   $$\cos(x) = \frac{\sqrt{3}}{2}$$
   (b) Find $\tan(x)$ if $\sin(x) = \frac{1}{2}$ and x is in the second quadrant.
   (c) Solve $\arctan(0) = x$.
   (d) Solve $\tan(x) = -\sqrt{3}$.
8. Show the following trig identities
   (a)
   $$\cos(-2x) - 2\cos^2(x) + 1 = 0$$
   (b)
   $$\tan^3(x) + \tan(x) = \sec^3(x)\sin(x)$$
   (c)
   $$\cos^4(x) - \sin^4(x) = \cos(2x)$$
9. Consider the complex number $z = \sqrt{3} + i$,
   (a) compute z^2
   (b) compute the conjugate
   (c) compute the product and the sum of z and $\sqrt{3}i + 5$
10. Find the inverse of the following functions and sketch them.
   (a)
   $$\frac{x-2}{x-3}$$
   (b)
   $$\log_2(x)$$
   (c)
   $$\log_2(x-1)$$
   (d)
   $$e^x + 1$$
11. Let $f(x) = \sqrt{x+1}$ and $g(x) = e^x - 1$
   (a) Compute $f + g$, and $f \circ g$
   (b) What is the domain of $f + g$, and $f \circ g$
12. Let $f(x) = \tan x$ and $g(x) = 2x$
   (a) Compute $f + g$, and $f \circ g$

(b) What is the domain of $f + g$, and $f \circ g$

13. Find the domain of the following functions

(a)
$$\frac{x-2}{(x-1)(x+3)}$$

(b)
$$\frac{x-2}{\log x}$$

(c)
$$\frac{1}{e^x}$$

(d)
$$\frac{x+1}{e^x-1}$$

(e)
$$\frac{\ln x}{x-1}$$

(f)
$$\frac{1}{\sin x}$$

14. Find the solutions of the following inequalities

(a)
$$-3x + 1 \leq 0$$

(b)
$$2x + 2 \geq 0$$

(c)
$$(x-3)^2(x+2)x \leq 0$$

(d)
$$(x-3)(x+5)(x+2)x^2 > 0$$

(e)
$$\frac{x-3}{(x+2)(x-1)^2} \geq 0$$

(f)
$$\frac{(x-3)^2(x-1)}{(x+2)(x-1)^2} \leq 0$$

15. Graph the following functions

(a)

$$(x-3)(x+5)(x+2)x^2 = 0$$

(b)

$$\log_2(x-1)+2$$

(c)

$$2\tan(3x)$$