Pre-calculus: Problem Set 14 Review of topics in Algebra 1 and College Algebra and extensions

1. Write an equation for a circle centered at the origin with an x-intercept of (4, 0).

2. Find the center and radius of the circle given by the equation $x^2 + y^2 + 4x + 10y + 15 = 0$.

Simplify the following.

3. $\dfrac{7^{3y-x}}{7^{4x-6y}}$

4. $5^{2x-3}5^{6-4x}$

5. $\left(3^{2x-6}\right)^2$

6. $e^x\left(e^{-x}+1\right) - e^{-x}\left(e^x+1\right)$

Find the difference quotient, $\dfrac{f(x+h)-f(x)}{h}$, for the following.

7. $f(x) = 2x^2 - 5$

8. $f(x) = \sqrt{3-x}$

9. $f(x) = \dfrac{2}{x+5}$

10. $f(x) = \dfrac{1}{\sqrt{x-4}}$

Use $f(x) = -\dfrac{1}{2}x^2 - x + 2$ to answer 11 – 15.

11. Write f(x) in standard form ($f(x) = a(x-h)^2 + k$).
12. Find the vertex of f(x).
13. Find the range of f(x).
14. Fine the x- and y- intercepts of f(x).
15. Identify the intervals for which f(x) is increasing and decreasing.

Solutions to Odd Problems:

1. C: (0, 0) x-int: (4, 0)
   The radius is 4.

$$x^2 + y^2 = 16$$

3.

$$\frac{7^{3y-x}}{7^{4x-6y}}$$

$$7^{(3y-x)-(4x-6y)}$$

$$7^{9y-5x}$$

5.

$$\left(3^{2x-6}\right)^2$$

$$3^{2(2x-6)}$$

$$3^{4x-12}$$

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7.

$$\frac{f(x+h)-f(x)}{h} = \frac{2(x+h)^2-5-(2x^2-5)}{h}$$
$$= \frac{2x^2+4xh+2h^2-2x^2+5}{h}$$
$$= \frac{4xh+2h^2}{h}$$
$$= 4x+2h$$

9.

$$\frac{f(x+h)-f(x)}{h} = \frac{\frac{2}{x+h+5}-\frac{2}{x+5}}{h}$$
$$= \frac{2(x+5)-2(x+h+5)}{h(x+5)(x+h+5)}$$
$$= \frac{2x+10-2x-2h-10}{h(x+5)(x+h+5)}$$
$$= \frac{-2h}{h(x+5)(x+h+5)}$$
$$= \frac{-2}{(x+5)(x+h+5)}$$

11.

$$f(x) = -\frac{1}{2}x^2 - x + 2$$
$$f(x) = \frac{-1}{2}(x^2+2x)+2$$
$$= \frac{-1}{2}(x^2+2x+1-1)+2$$
$$= \frac{-1}{2}(x^2+2x+1)+\frac{1}{2}+2$$
$$= \frac{-1}{2}(x+1)^2+\frac{5}{2}$$

13. R: $\left(-\infty, \frac{5}{2}\right]$

15. f(x) is increasing on $(-\infty,-1)$

f(x) is decreasing on $(-1,\infty)$

<u>Answers to Even Problems:</u>

2. C: (-2, -5) r = $\sqrt{14}$

4. 5^{3-2x}

6. $e^x - e^{-x}$

8. $\frac{-1}{\sqrt{3-x-h}+\sqrt{3-x}}$

10. $\frac{-1}{\sqrt{x-4}\sqrt{x+h-4}\left(\sqrt{x-4}+\sqrt{x+h-4}\right)}$

12. $\left(-1, \frac{5}{2}\right)$

14. $(0,2), (-1\pm\sqrt{5}, 0)$