

7.4

1. a) $y = \frac{1}{-x+2}$ b) $y = \frac{1}{3x-5}$ c) $y = \frac{1}{x^2-9}$ d) $y = \frac{1}{x^2-7x+10}$

2. a) $f(x) = x+5$ (i) $(-5, 0)$ (iv) same value
 (ii) $y = \frac{1}{x+5}$ (v) $x = -5$

(iii) $x \neq -5$

b) $g(x) = 2x+1$ (i) $(-\frac{1}{2}, 0)$ (iv) same value
 (ii) $y = \frac{1}{2x+1}$ (v) $x = -\frac{1}{2}$

(iii) $x \neq -\frac{1}{2}$

c) $h(x) = x^2-16$ (i) $(-4, 0) (4, 0)$ (iv) same values
 (ii) $y = \frac{1}{x^2-16}$ (v) $x = 4, x = -4$

(iii) $x \neq \pm 4$

d) $t(x) = x^2+x-12$ (i) $(-4, 0) (3, 0)$ (iii) $x \neq -4, 3$
 $(x+4)(x-3)$ (ii) $y = \frac{1}{x^2+x-12}$ (iv) same values
 (v) $x = -4, x = 3$

3. a) $5x-10=0$ b) $3x+7=0$ c) $(x-2)(x+4)=0$ d) $(x-5)(x-4)=0$
 $\therefore x=2$ $\therefore x = -\frac{7}{3}$ $\therefore x=2, x=-4$ $\therefore x=4, x=5$

4. undefined at $x=3$ because $f(x) = \frac{1}{x-3}$ is $\frac{1}{0}$ at $x=3$

5. a) $x: 0 = \frac{1}{x+5}$ $y: y = \frac{1}{0+5}$
 $0 = 1$ $y = \frac{1}{5}$
 no solution $(0, \frac{1}{5})$
 \therefore no x -intercept

5b) x: $0 = \frac{1}{3x-4}$
 $0 = 1 \therefore$ no x-int

y: $y = \frac{1}{0-4} \quad y = -\frac{1}{4}$
 $(0, -\frac{1}{4})$

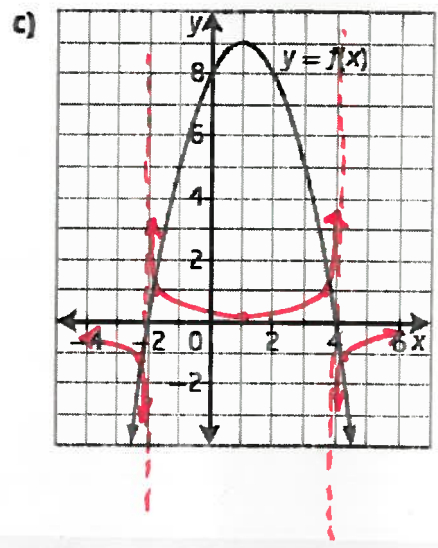
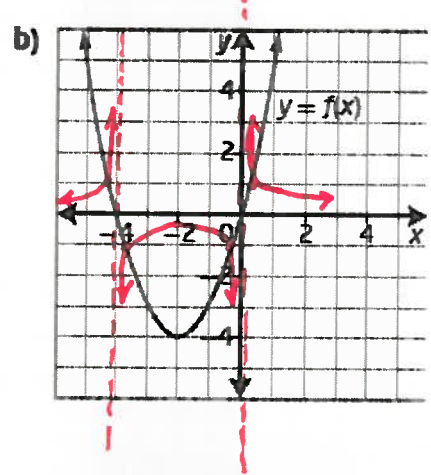
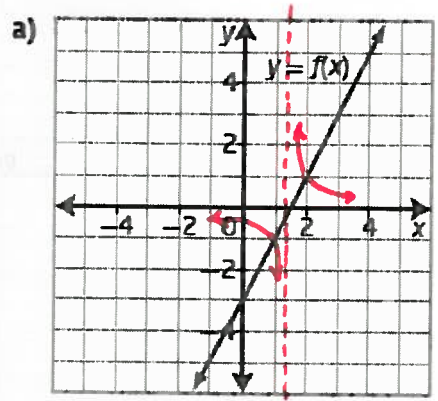
c) x: $0 = \frac{1}{x^2-9}$
 $0 = 1 \therefore$ no x-int

y: $y = \frac{1}{0-9} \quad y = -\frac{1}{9}$
 $(0, -\frac{1}{9})$

d) x: $0 = \frac{1}{x^2+7x+12}$
 $0 = 1 \therefore$ no x-int.

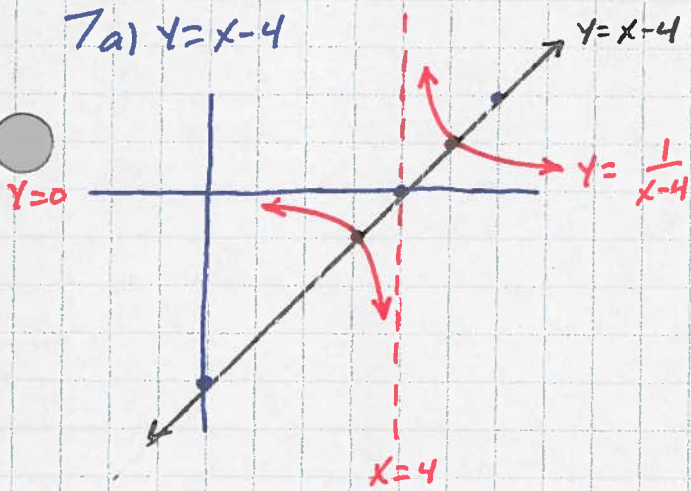
y: $y = \frac{1}{0+0+12} \quad y = \frac{1}{12}$
 $(0, \frac{1}{12})$

6

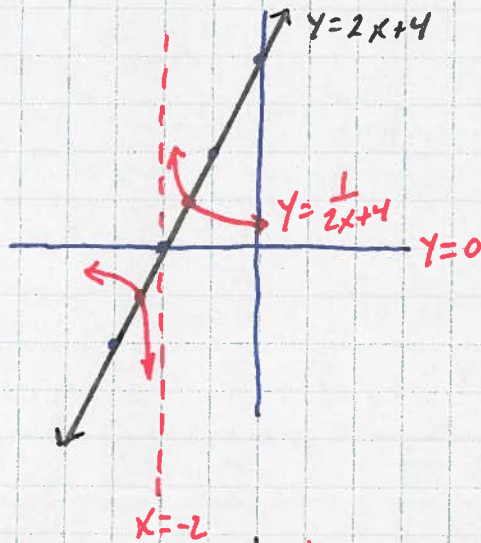


method: draw vertical asymptotes at zeroes of original $f(x)$
 curves intersect at $y=1$ and $y=-1$
 as $f(x) \rightarrow \infty$, reciprocal $\rightarrow 0$
 as $f(x) \rightarrow 0$, reciprocal $\rightarrow \infty$
 if vertex at -4 , reciprocal $-\frac{1}{4}$
 " 9 , " $\frac{1}{9}$

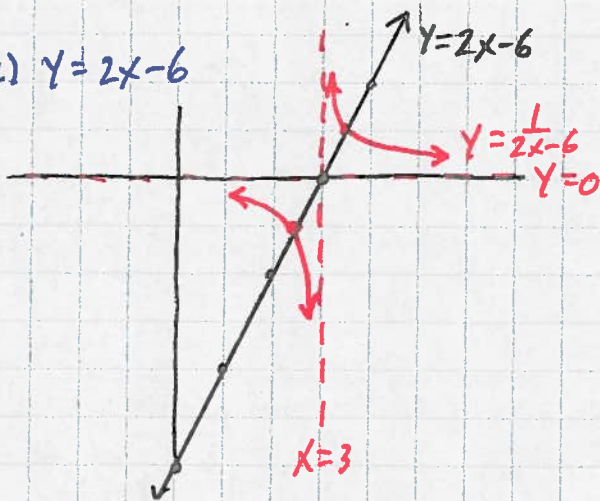
7a) $y = x - 4$



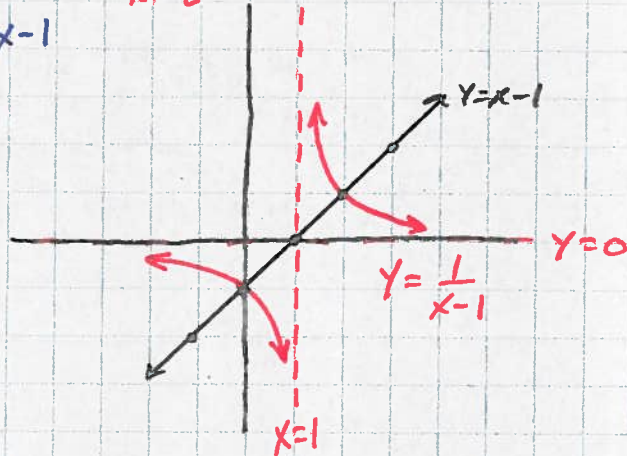
b)



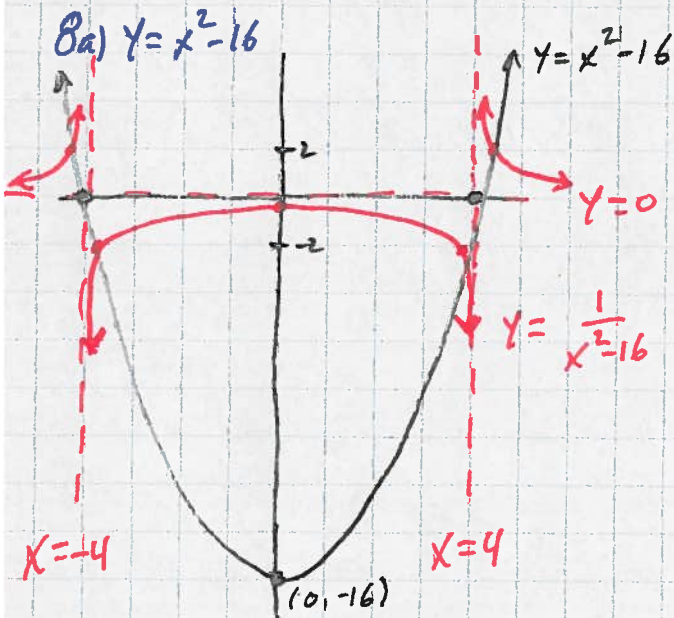
c) $y = 2x - 6$



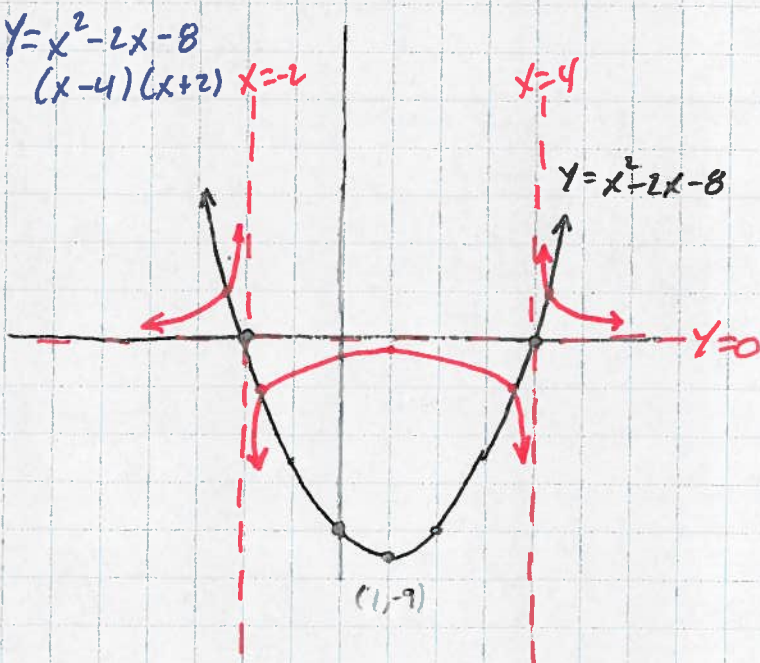
d) $y = x - 1$



8a) $y = x^2 - 16$

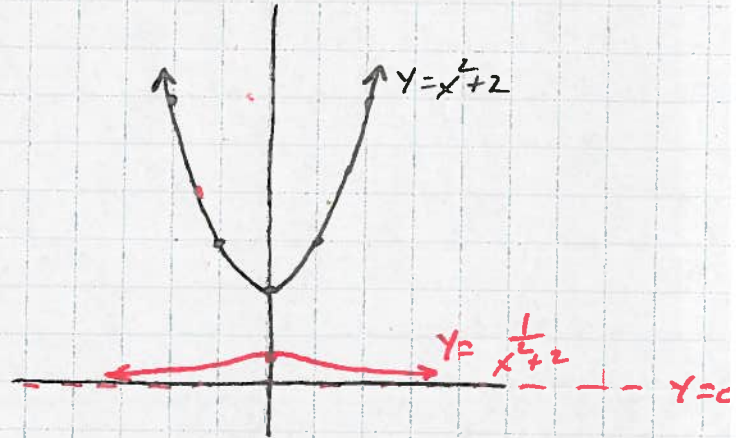
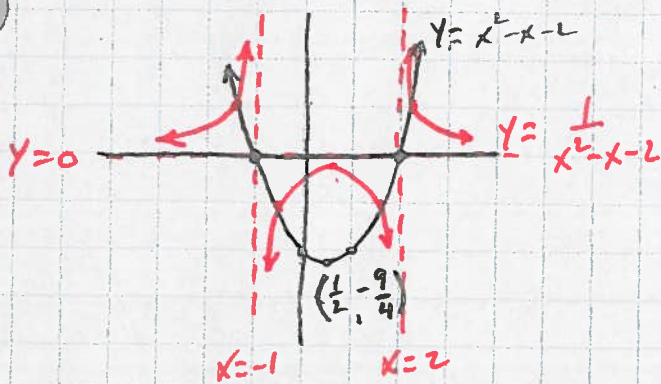


b) $y = x^2 - 2x - 8$



8c) $y = x^2 - x - 2$
 $(x-2)(x+1)$

d) $y = x^2 + 2$



- 9a) 1 VA at $x=2$ \therefore D
- b) 1 VA at $x=2$, crosses $y=1$ twice \therefore C
- c) VA at $x=1$ and $x=2$ \therefore A
- d) 1 VA at $x=-1$ \therefore B

10 a) asymptote at $x=3$ \therefore original $(3,0)$ shared point $(4,1)$
 slope 1

$$y = x + b$$

$$0 = 3 + b \quad b = -3$$

$$y = x - 3$$

b) asymptotes of $x = -3$ and 1 \therefore original $(-3,0)$ $(1,0)$

$$y = a(x+3)(x-1) \quad \text{reciprocal } (-1, -1/4)$$

$$\text{original } (-1, -4)$$

$$-4 = a(-1+3)(-1-1)$$

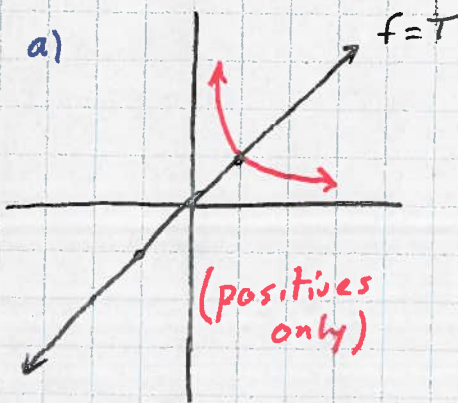
$$-4 = a(2)(-2)$$

$$-4 = -4a \quad a = 1$$

$$y = (x+3)(x-1)$$

$$\text{or } y = x^2 + 2x - 3$$

11 $f = \frac{1}{T}$ is same as $y = \frac{1}{x}$



b) $f = T$

c) $f = \frac{1}{2.5}$

$f = 0.4 \text{ Hz}$

d) $1.6 = \frac{1}{T} \quad T = \frac{1}{1.6} \quad T = \frac{5}{8} \text{ or } 0.625 \text{ seconds}$

12. $t = \frac{525}{d-10}$

b) $d > 10$

c) $t = \frac{525}{40-10} = 17.5 \text{ min}$

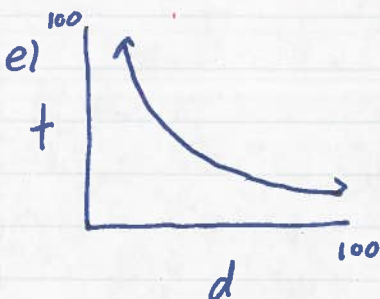
d) $40 = \frac{525}{d-10}$

$40d - 400 = 525$

$40d = 925$

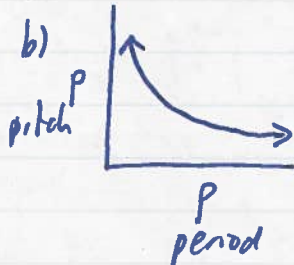
$d = 23.125 \text{ m}$

(a depth of 23.125 m requires 40 min)



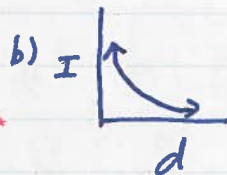
as d increases $t \rightarrow 0$, meaning for great depths you'd need to decompress almost continually

13a) $p = \frac{1}{P}$



c) $p = \frac{1}{0.048} = 20.8 \text{ Hz}$

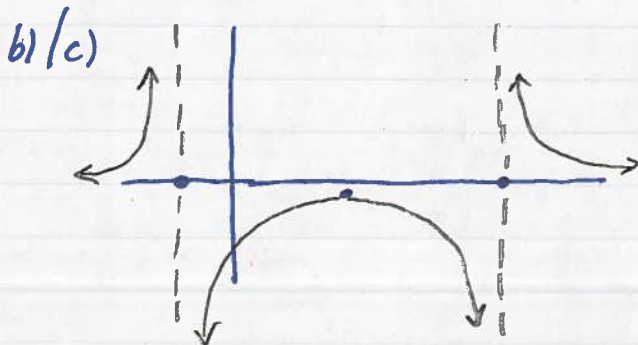
14a) $I = 0.004 \left(\frac{1}{d^2} \right)$ or $I = \frac{0.004}{d^2}$



c) $I = \frac{0.004}{5^2} = 0.00016 \text{ W/m}^2$

15. $y = x^2 - 6x - 7$ $(x-7)(x+1)$

a) vertex: $x = \frac{-b}{2a} = \frac{6}{2} = 3$ (sub) $y = 9 - 18 - 7 = -16$ $(3, -16)$

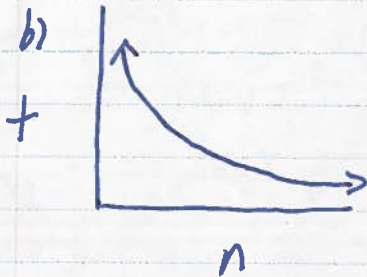


x intercept give VA
vertex tells max at $(3, -16)$

$$16a) t = \frac{K}{n}$$

$$720 = \frac{K}{1000}$$

$$K = 720000$$



$$c) t = \frac{720000}{400}$$

$$t = 1800 \text{ days}$$

$$d) 500 = \frac{720000}{n}$$

$$n = \frac{720000}{500}$$

$$n = 1440 \text{ workers.}$$