# Answers
# for Grade 12 Group Assignments - Quarter #2

Notes:
- Answers for group assignment problems that are out of the workbook can be found in the file named "G12 – Workbook Answers…".
- This answer key doesn't include all answers.

## Week 9

1) The vertex of the parabola $f(x) = 3x^2 - 7x - 5$

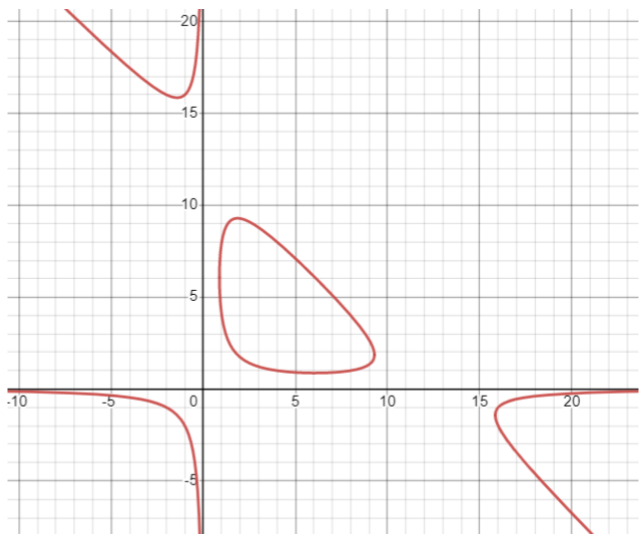
   $f'(x) = 6x - 7$

   The vertex must be where the slope is equal to zero. Therefore, we get

   $0 = 6x - 7 \rightarrow x = {}^7/_6$ This is the x-coordinate of the vertex. We find the y-coordinate by plugging this x-value into the original function. $f({}^7/_6) = \frac{-109}{12}$ The vertex is (1.167, -9.083)

## Week 10

1) 8, 4, 1
2) 16, -2, -1
3) $x^2y + xy^2 - 13xy + 32=0$. See graph →




## Week 11

### Three Numbers – Part II

1) x=2; $y,z = \frac{11 \pm \sqrt{57}}{2} \approx 1.73,\ 9.27$
2) x=10; $y,z = \frac{15 \pm \sqrt{95}\,i}{10} \approx 1.5 \pm 0.975\,I$
3) This leads to $yx^2 = 32$ and $2x + y = 13$, which becomes $0 = 2x^3 - 13x^2 + 32$.

   Plugging into the cubic formula gives solutions for x as:

   $x_1 = 6.06504$

   $x_2 = -1.42123$

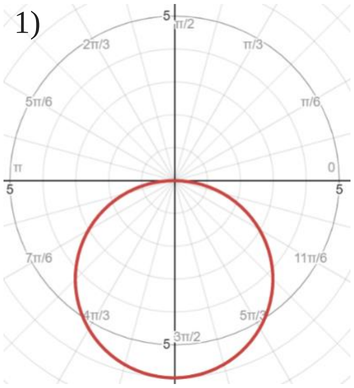
   $x_3 = 1.85619$

**A 9-Colored Cube**. We start with the realization that the color of the center piece of the whole cube, must be the same color of a pair of opposite vertices. We now need to find colors for 12 edges, 6 vertices, and 6 centers (of faces). We assign two colors that are found at three edges each (no vertices or centers. The remaining six colors must each be on a vertex, edge, and center.

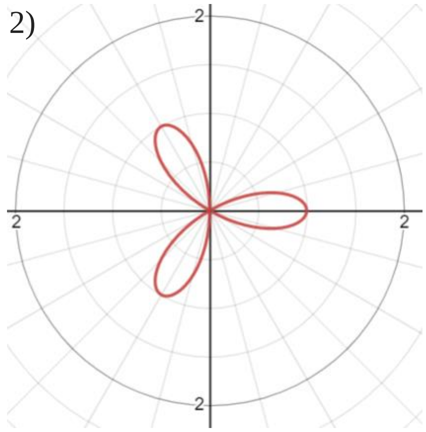
## Week 12 No answers given.

# Week 13

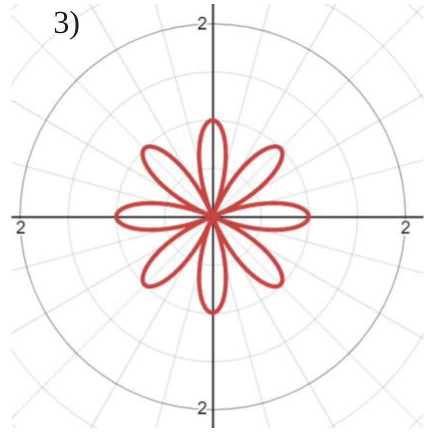
1)



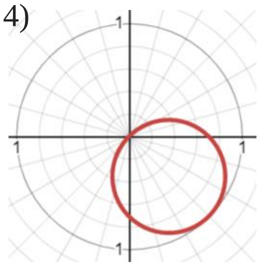

2)



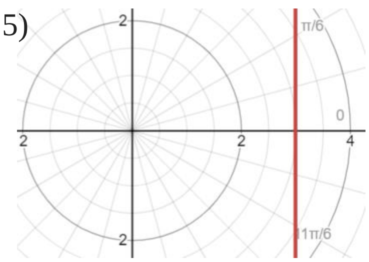

3)



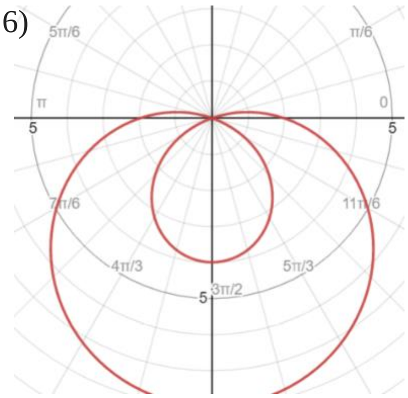

4)



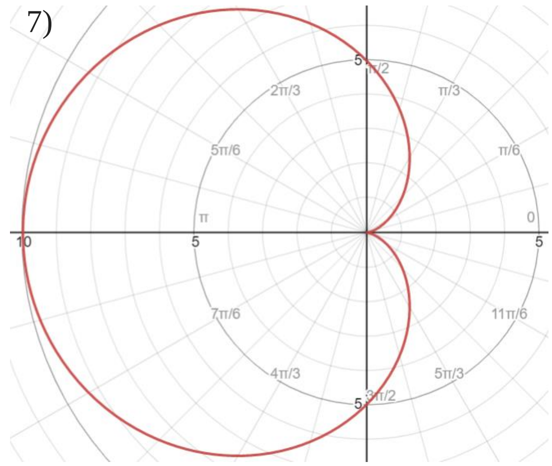

5)




6)




7)




8) d is the diameter of the circle
9) If k is odd, then it is the number of petals in the flower. If k is even, the number of petals is 2k.
10) The form rotates counterclockwise about the origin by C radians.
11) Rotated by $\pi/4$ radians from each other.
12) This form ($r = n + m\cos\theta$) is called a limaçon. If $n > m$ then it appears as a "dented in" circle. If $n = m$ then it is a cardioid. If $n < m$ then there is a loop – the greater the ratio of m:n, the larger the loop.

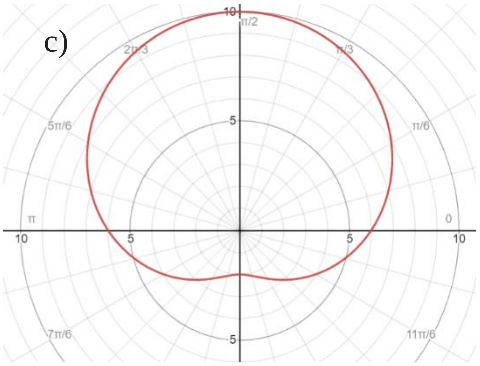
**Week 14**

1) a) $r = 2 + 8\cos\theta$

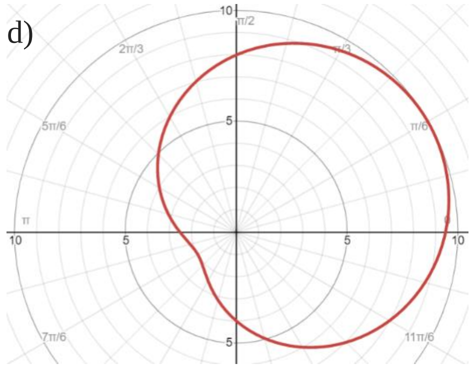
b) A=(10, 0); B=(-6,π); C=$(6,{}^{\pi}/_{3})$; D=$(-6,{}^{5\pi}/_{3})$; E=$(-2,{}^{2\pi}/_{3})$; F=$(\approx -4.93,{}^{7\pi}/_{6})$; G=$(\approx 8.93,{}^{\pi}/_{6})$; H=$(0,\approx 1.823)$

<u>Notes</u>: $2 - 4\sqrt{3} \approx \underline{-4.93}$ and $\cos^{-1}(-0.25) \approx \underline{1.823}$ radians ≈ 104½°

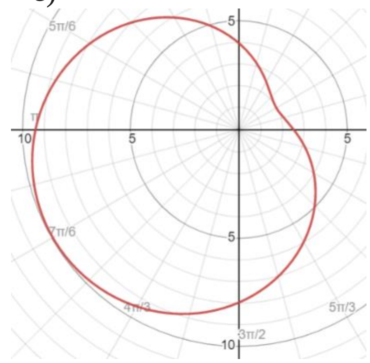
c)



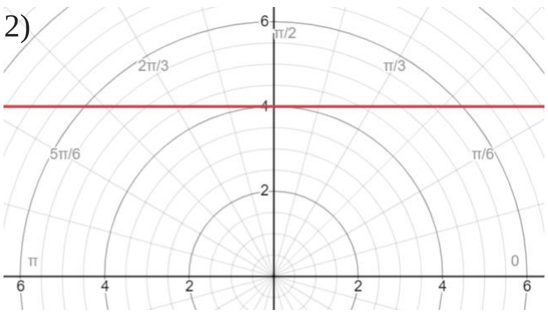

d)




e)




2)



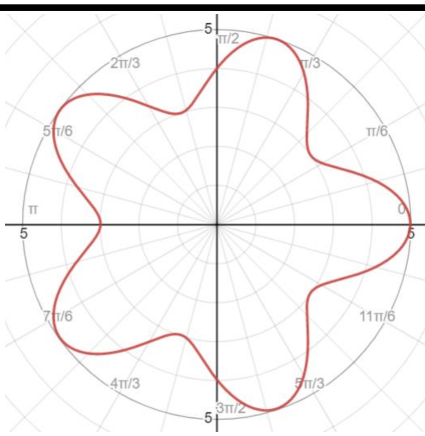

3) $r = \frac{-3}{\sin\theta}$ or $r = \frac{3}{\cos(\theta + {}^{\pi}/_{2})}$

4) $r = \frac{-3\sqrt{2}}{\cos(\theta + {}^{\pi}/_{4})}$ or $r = \frac{3\sqrt{2}}{\cos(\theta - {}^{3\pi}/_{4})}$ or $r = \frac{3\sqrt{2}}{\sin(\theta - {}^{\pi}/_{4})}$

5) Assuming positive values of a and b (because the signs don't matter),
If a=b then we get a parabola;
If a>b then we get an ellipse;
If a<b then we get a hyperbola;

---

6)




7) b determines the number of bumps and dents. The greater a becomes, the greater the size of the form and the less pronounced the bumps.

8) $r = 4 + \cos({}^{7}/_{2}\,\theta)$

9) We have an equation in the form
$r = 4\cos(\frac{a}{b}\theta)$.

If a and b are both odd, then:

- a (the numerator) is the number of outer loops in the form (and also the number of inner loops).
- $(a + b) \div 2$ is the number of 360° rotations. (Imagine that a figure skater is following the curve.)
- $2b\pi$ is the period of the function – i.e., what is required in order to trace the form for one complete cycle.

If either a or b is even, then:

- 2a is the number of loops in the form.
- $a + b$ is the number of 360° rotations.
- $b\pi$ is the period of the function.

(Note that because ${}^{a}/_{b}$ must be a reduced fraction, a and b can't both be even.)

## Week 15

1) a) $f'(x) = -3x^{-4} \rightarrow \frac{-3}{x^4}$

   b) $-\frac{3}{16}$

   c) $-\frac{3}{16}$

   d) never

   e) $F(x) = -\frac{1}{2x^2}$

   f) $F(2) - F(1) \rightarrow (-\tfrac{1}{8}) - (-\tfrac{1}{2}) \rightarrow \tfrac{3}{8}$

2) a) $35x^6$

   b) $\frac{-35}{x^8}$

   c) $\frac{-5}{x^2}$

   d) 0

   e) $\frac{5x^8}{8} + c$

   f) $\frac{-5}{6x^6} + c$

   g) We'll learn how to do this in the next lecture.

   h) $5x + c$

3) $f(x) = \cos(x)$

$$f'(x) = \lim_{h\to 0} \frac{\cos(x+h) - \cos(x)}{h}$$

$$= \lim_{h\to 0} \frac{\cos(x)\cos(h) - \sin(x)\sin(h) - \cos(x)}{h}$$

$$= \lim_{h\to 0} \frac{\cos(x)\cos(h) - \cos(x)}{h} - \lim_{h\to 0} \frac{\sin(x)\sin(h)}{h}$$

$$= \lim_{h\to 0} \cos(x)\frac{\cos(h) - 1}{h} - \lim_{h\to 0} \sin(x)\frac{\sin(h)}{h}$$

$$= \cos(x) \cdot 0 - \sin(x) \cdot 1$$

$$\therefore \mathbf{f'(x) = -\sin(x)}$$

4) $\int_0^{\pi} \sin x \, dx \rightarrow F(x) = -\cos(x)$ Therefore the area is $F(\pi) - F(0) \rightarrow -\cos(\pi) - -\cos(0) \rightarrow 1+1=$<u>**2**</u>

6) We will likely go over this problem in the tutorial.

## Week 16 No answers needed.