HM3 Final Review

① $f(x) = -x^3 + 2x^2 + 2$

as $x \to -\infty,\ y \to \infty$
$x \to \infty,\ y \to -\infty$

② $f(x) = -x^4 + 3x^2 - x + 1$

as $x \to -\infty,\ y \to -\infty$
$x \to \infty,\ y \to -\infty$

③ $\dfrac{2x^2}{x^2+8x-9} \div \dfrac{5}{5x+45}$

$\dfrac{2x^2}{\cancel{(x+9)}(x-1)} \cdot \dfrac{\cancel{5}\cancel{(x+9)}}{\cancel{5}}$

$\boxed{\dfrac{2x^2}{x-1}}$

④ $\dfrac{n^2+2n-35}{9} \cdot \dfrac{n+2}{n^2+2n-35}$

$\dfrac{\cancel{(n+7)}\cancel{(n-5)}}{9} \cdot \dfrac{n+2}{\cancel{(n+7)}\cancel{(n-5)}}$

$\boxed{\dfrac{n+2}{9}}$

⑤ $\dfrac{9k}{9} \div \dfrac{9k}{9k+45}$

$\dfrac{\cancel{k}}{1} \cdot \dfrac{\cancel{9}(k+5)}{\cancel{9}\cancel{k}}$

$\boxed{k+5}$

⑥ $\dfrac{27r+81}{r-8} \div \dfrac{27r+81}{9}$

$\dfrac{\cancel{27}\cancel{(r+3)}}{r-8} \cdot \dfrac{9}{\cancel{27}\cancel{(r+3)}}$

$\boxed{\dfrac{9}{r-8}}$

⑦ $f(x) = 3x^3 + 10x^2 + 12x + 3$

$\boxed{3 \text{ roots}}$ 1, 3 1, 3

possible rational $\boxed{\pm\ 1, 3, \tfrac{1}{3}}$

$f(x) = P$ no sign changes

0 $+\mathbb{R}$

$f(-x) = 3(-x)^3 + 10(-x)^2 + 12(-x) + 3$
$f(-x) = -3x^3 + 10x^2 - 12x + 3$
$N \to P \to N \to P$
3 changes
3 or 1 $-\mathbb{R}$

$+\mathbb{R}$	0	0
$-\mathbb{R}$	3	1
imag/irr	0	2

8) $f(x) = 5x^3 - x^2 - 5x + 1$

$\boxed{\text{3 roots}}$ 1, 5   1

ssible ational roots : $\boxed{\pm 1, \tfrac{1}{5}}$

$f(-x) = 5(-x)^3 - (-x)^2 - 5(-x) + 1$

$f(-x) = -5x^3 - x^2 + 5x + 1$

N $\longrightarrow$ P

1 sign change

1 $-\mathbb{R}$

$f(x) = P \rightarrow N \longrightarrow P$

2 changes

2 or 0 $+\mathbb{R}$

$+\mathbb{R}$	2	0
$-\mathbb{R}$	1	1
imag / irr	0	2

9) $\dfrac{2}{2v^2 - 8v + 6} - \dfrac{5}{3}$

$\dfrac{2}{\cancel{2}(v^2 - 4v + 3)} - \dfrac{5}{3}$

$\dfrac{1}{(v-3)(v-1)} - \dfrac{5}{3}$ CD: $3(v-3)(v-1)$

$\dfrac{3}{3(v-3)(v-1)} - \dfrac{5(v-3)(v-1)}{3(v-3)(v-1)}$

$\dfrac{3 - 5v^2 + 20v - 15}{3(v-3)(v-1)}$

$\boxed{\dfrac{-5v^2 + 20v - 12}{3(v-3)(v-1)}}$

10) $\dfrac{6}{a-5} - \dfrac{4a}{a+4}$ CD: $(a-5)(a+4)$

$\dfrac{6(a+4)}{(a-5)(a+4)} - \dfrac{4a(a-5)}{(a-5)(a+4)}$

$\dfrac{6a + 24 - 4a^2 + 20a}{(a-5)(a+4)}$

$\boxed{\dfrac{-4a^2 + 26a + 24}{(a-5)(a+4)}}$

11) $(3,-2)$ $r=5$

$$\boxed{(x-3)^2+(y+2)^2=25}$$

12) $(-3,-5)$ $c=24\pi$

$$24\cancel{\pi}=2\cancel{\pi}r$$

$$24=2r$$

$$r=12$$

$$\boxed{(x+3)^2+(y+5)^2=144}$$

13) center $(13,12)$ point $(7,12)$

$$r=\sqrt{(13-7)^2+(12-12)^2}$$

$$r=\sqrt{6^2+0^2}$$

$$r=\sqrt{36}$$

$$r=6$$

$$\boxed{(x-13)^2+(y-12)^2=36}$$

14) $x^2+y^2+14x-22y+134=0$

$$x^2+14x+\underline{49}+y^2-22y+\underline{121}=-134+\underline{49}+\underline{121}$$

$$\boxed{(x+7)^2+(y-11)^2=36}$$

15) $0, -3, -4/5$

$$x(x+3)(5x+4)$$

$$x(5x^2+4x+15x+12)$$

$$x(5x^2+19x+12)$$

$$\boxed{f(x)=5x^3+19x^2+12x}$$

16) $-\frac{2}{5}, -1, 2$

$$(5x+2)(x+1)(x-2)$$

$$(5x^2+5x+2x+2)(x-2)$$

$$(5x^2+7x+2)(x-2)$$

$$5x^3-10x^2+7x^2-14x+2x-4$$

$$\boxed{f(x)=5x^3-3x^2-12x-4}$$

17) $1, \sqrt{3}$ ← $-\sqrt{3}$ also exists

$(x-1)$ $\underline{\text{sum}}: 0$

$\underline{\text{prod}}: -3$

↓

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

$$x^3-3x-x^2+3$$

$$\boxed{f(x)=x^3-x^2-3x+3}$$

18) $2, -3+3i$ ← $-3-3i$ also exists

$(x-2)$ $\underline{\text{sum}}: -6$

$\underline{\text{prod}}: 9-9i^2$

$$9-9(-1)$$

$$9+9=18$$

↓

$$(x-2)(x^2+6x+18)$$

$$x^3+6x^2+18x-2x^2-12x-36$$

$$\boxed{f(x)=x^3+4x^2+6x-36}$$

$-2+\sqrt{6}$, $3+2i$

$\star\ -2-\sqrt{6}$, $\star\ 3-2i$

SUM : -4

prod : $4-6$

-2

SUM : 6

prod : $9-4i^2$

13

$(x^2+4x-2)(x^2-6x+13)$

$\cancel{x^4}-\cancel{6x^3}+\cancel{13x^2}+\cancel{4x^3}-\cancel{24x^2}+\cancel{52x}-\cancel{2x^2}+\cancel{12x}-26$

$\boxed{f(x)=x^4-2x^3-13x^2+64x-26}$

20 Arc Length $=\dfrac{\theta}{360}\cdot 2\pi r$

$\star$ in radians its : $\dfrac{\theta}{2\pi}\cdot 2\pi r$

$\dfrac{\frac{7\pi}{4}}{\cancel{2\pi}}\cdot\cancel{2\pi}(13)$

$\dfrac{7\pi}{4}\cdot 13 = \boxed{\dfrac{91\pi}{4}\text{ in}}$

21 $\dfrac{90}{360}\cdot 2\pi(12)$

$\boxed{6\pi \text{ ft}}$

22 Sector Area $=\dfrac{\theta}{360}\cdot\pi r^2$

$\dfrac{300}{360}\cdot\pi(10)^2$

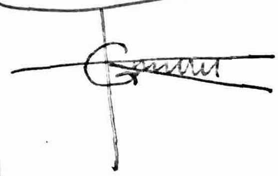
$\boxed{\dfrac{250\pi}{3}\text{ ft}^2}$

23 $\dfrac{\frac{5\pi}{6}}{2\cancel{\pi}}\cdot\cancel{\pi}(13)^2$

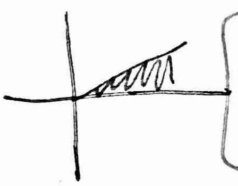
$\boxed{\dfrac{845\pi}{12}\text{ yd}^2}$

24 $\dfrac{11\pi}{6}$

$\boxed{\pi/6}$



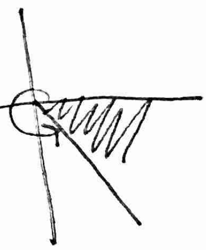
25 $-\dfrac{29\pi}{18}+2\pi=\dfrac{7\pi}{18}$



$\boxed{\dfrac{7\pi}{18}}$

26 $285°$

$\boxed{75°}$



27 $-545°+360=-185+360=175°$

$\boxed{5°}$