1. $\frac{1}{3} = a + (2-1)d$ $\quad \frac{13}{3} = a + (8-1)d$

$\frac{1}{3} = a + d$ $\quad \frac{13}{3} = a + 7d$

② $\frac{13}{3} = a + 7d$

① $\frac{1}{3} = a + d$

② − ① $\frac{12}{3} = 6d$

$4 = 6d$

$\frac{4}{6} = d$

$d = \frac{2}{3}$

$\frac{1}{3} = a + \frac{2}{3}$

$\frac{1}{3} - \frac{2}{3} = a$

$a = -\frac{1}{3}$

(b) $t_n = -\frac{1}{3} + (n-1)\frac{2}{3}$

$= -\frac{1}{3} + \frac{2}{3}n - \frac{2}{3}$

$t_n = \frac{2}{3}n - \frac{3}{3}$

$t_n = \frac{2}{3}n - 1$

(c) $t_{12} = \frac{2}{3}(12) - 1$

$= 8 - 1$

$= 7$

$t_{26} = \frac{2}{3}(26) - 1$

$= \frac{52}{3} - \frac{3}{3}$

$= \frac{49}{3}$

(d) $9 = \frac{2}{3}n - 1$

$10 = \frac{2}{3}n$

$30 = 2n$

$15 = n$

$\frac{97}{3} = \frac{2}{3}n - 1$

$\frac{97}{3} + 1 = \frac{2}{3}n$

$\frac{97}{3} + \frac{3}{3} = \frac{2}{3}n$

$\frac{100}{3} = \frac{2}{3}n$

$100 = 2n$

$50 = n$

(e) $S_{200} = \frac{200}{2}\left[2\left(-\frac{1}{3}\right) + (200-1)\frac{2}{3}\right]$

$= 100\left[-\frac{2}{3} + 199\left(\frac{2}{3}\right)\right]$

$= 100\left[-\frac{2}{3} + \frac{398}{3}\right]$

$= 100\left[\frac{396}{3}\right]$

$= 13200$

2. $162 = ar^{5-1}$ $\quad 13122 = ar^{9-1}$

(a) $162 = ar^4$ $\quad 13122 = ar^8$

$$\text{②}\ 13122 = \cancel{a}r^8$$
$$\text{①}\ 162 = \cancel{a}r^4$$

②÷① $\quad 81 = r^4$

$3 = r$

$162 = a(3)^4$

$162 = 81a$

$2 = a$

(b) $t_n = 2(3)^{n-1}$

(c) $t_3 = 2(3)^{3-1}$

$= 18$

$t_{10} = 2(3)^{10-1}$

$= 2(3)^9$

$= 39366$

(e) $S_{10} = \dfrac{2[3^{10}-1]}{3-1}$

$= 59048$

(d) $9565938 = 2(3)^{n-1}$

$4782969 = 3^{n-1}$

$\log_3 4782969 = n-1$

$14 = n-1$

$15 = n$

n has to be a whole number

$1458 = 2(3)^{n-1}$

$729 = 3^{n-1}$

$\log_3 729 = n-1$

$6 = n-1$

$7 = n$

3. $t_n = 2 - n + 3n^2$

$t_1 = 2 - 1 + 3(1)^2 = 4$

$t_2 = 12$

$t_3 = 26$

$t_4 = 46$

$t_5 = 72$

4. Need n

(a) geometric

$t_n = ar^{n-1}$

$3 = 12582912\left(\frac{1}{2}\right)^{n-1}$

$\dfrac{3}{12582912} = \left(\frac{1}{2}\right)^{n-1}$

$\log_{\frac{1}{2}}\left(\dfrac{3}{12582912}\right) = n-1$

$22 = n-1$

$n = 23$

$S_{23} = \dfrac{12582912\left[\left(\frac{1}{2}\right)^{23}-1\right]}{\left(\frac{1}{2}-1\right)}$

$= 25165821$

(b) arithmetic

$12030 = 24 + (n-1)6$

$12030 = 24 + 6n - 6$

$12030 = 18 + 6n$

$12012 = 6n$

$2002 = n$

$S_{2002} = \dfrac{2002}{2}\left[2(24) + (2002-1)6\right]$

$= 12066054$

5.(a) $t_{20}=-231$; $t_{35}=-411$

$-231=a+(20-1)d$ $-411=a+(35-1)d$

$-231=a+19d$ $-411=a+34d$

① $-411=a+34d$

② $-231=a+19d$

①-② $-180=15d$

$-12=d$

$-231=a+19(-12)$

$-3=a$

$S_{300}=\frac{300}{2}[2(-3)+(300-1)(-12)]$

$=-539100$

(b) $1835008=ar^{10-1}$ $112=ar^{3-1}$

$1835008=ar^{9}$ $112=ar^{2}$

① $1835008=\cancel{a}r^{9}$

② $112=\cancel{a}r^{2}$

①÷② $16384=r^{7}$

$\sqrt[7]{16384}=r$

$4=r$

$112=a(4)^{2}$

$7=a$

$S_{14}=\frac{7[4^{14}-1]}{4-1}$

$=626349395$

5.(c) $-170=a+(15-1)d$ $-86=a+(8-1)d$

$-170=a+14d$ $-86=a+7d$

① $-170=a+14d$

② $-86=a+7d$

①-② $-84=7d$

$-12=d$

$-86=a+7(-12)$

$-86=a-84$

$-2=a$

$S_{200}=\frac{200}{2}[2(-2)+(200-1)(-12)]$

$=-239200$

(d) $885735=ar^{12-1}$ $135=ar^{4-1}$

$885735=ar^{11}$ $135=ar^{3}$

① $885735=\cancel{a}r^{11}$

② $135=\cancel{a}r^{3}$

①÷② $6561=r^{8}$

$\sqrt[8]{6561}=r$

$3=r$

$135=a(3)^{3}$

$5=a$

$S_{14}=\frac{5[3^{14}-1]}{3-1}$

$=11957420$

6(a) $5+15+45+135+\ldots$ Keeps getting larger (∞) therefore diverges

(b) $50+25+12.5+\ldots$

$S_n=\frac{50[(\frac{1}{2})^{n}-1]}{\frac{1}{2}-1}$

$\lim_{n\to\infty}\frac{50[(\frac{1}{2})^{n}-1]}{[\frac{1}{2}-1]}$

$\frac{50[0-1]}{[\frac{1}{2}-1]}$

$=100$

7.

(a) $V = 5000(1.025)^t$

(b) 5125, 5253.13, 5384.45, ...

(c) $V = 5000(1.025)^8$

$= 6092.01$

(d) $11866 = 5000(1.025)^t$

$2.3732 = 1.025^t$

$\log_{1.025} 2.3732 = t$

$t = 34.9999$

35 yrs

8. $S_n = \frac{a[r^n - 1]}{r-1}$

$-3280 = \frac{a[(-3)^8 - 1]}{[-3-1]}$

$-3280 = \frac{a[6560]}{-4}$

$-2 = a$

$r = -3$

$a = t_1 = 2$

9. (a) conv to 0

(b) conv to 5/3

(c) conv to 0

(d) diverge

10. (a) $-3/4$

(b) expand first $\lim_{x \to \infty} \frac{14x^2 + 29x - 15}{10x^2 - 6x - 4}$

$= 14/10 = 7/5$

(c) $0/10 = 0$

(d) $10(0) = 0$

(e) ∞ OR DNE

(f) 0

11. (a) $\sum_{k=1}^{90} 4k^3$

$4\left[\frac{n(n+1)}{2}\right]^2$

$4\left(\frac{90(91)}{2}\right)^2$

$= 67076100$

(b) $\sum_{k=1}^{999} 17$

$= 17n$

$= 17(999)$

16983

(c) $\sum_{k=1}^{75} 8k^2 - 15k + 2$

$8\left[\frac{n(n+1)(2n+1)}{6}\right] - 15\left[\frac{n(n+1)}{2}\right] + 2n$

$8\left[\frac{75(76)(151)}{6}\right] - 15\left(\frac{75(76)}{2}\right) + 2(75)$

$= 1105000$

(d) $\sum_{k=50}^{150} (k^3 - 3)$

$\sum_{k=1}^{150} (k^3 - 3) - \sum_{k=1}^{49} (k^3 - 3)$

$n = 150 \qquad n = 49$

$\left(\left[\frac{n(n+1)}{2}\right]^2 - 3n\right) - \left(\left(\frac{n(n+1)}{2}\right)^2 - 3n\right)$

$\left[\left(\frac{150(151)}{2}\right)^2 - 3(150)\right] - \left[\left(\frac{49(50)}{2}\right)^2 - 3(49)\right]$

$128255175 - 1500478$

126754697

$\sum_{k=75}^{100} (3k^2 - 10)$

Quad const

$\left(3\left[\frac{n(n+1)(2n+1)}{6}\right] - 10[n]\right) - \left(3\left[\frac{n(n+1)(2n+1)}{6}\right] - 10(n)\right)$

$\left(3\left[\frac{100(101)(201)}{6}\right] - 10(100)\right) - \left(\frac{3(74)(75)(149)}{6} - 10(74)\right)$

$\sum_{k=6}^{10} k^2 \qquad 36 + 49 + 64 + 81 + 100$

$\sum_{k=1}^{10} \boxed{1 + 4 + 9 + 25} + 36 + 49 + 64 + 81 + 100$

Unit 2.

1. 21 sandwiches
$21 \times 3 \times 8 \times 7 = 3528$

2. PERMUTATION
$\frac{11!}{2!}$
$= 19958400$
more
JunEui is correct

COMBINATION
$\frac{11!}{2!2!2!}$
$= 4989600$

3. EEEEEENNNNNN $\frac{12!}{6!6!} = 924$

4. 5 Burnt out letters
9 Good letters

3 good and 2 burnt out
${}_9C_3 \times {}_5C_2$
$= 84 \times 10$
$= 840$

5. CHARLOTTETOWN

(a) $\frac{13!}{2!3!}$
$= 518918400$

(b) CHAR~~L~~OTTETOWN
$\frac{12!}{2!3!}$
$= 39916800$

(c) 518918400
$-$ 39916800
479001600

(d) start L end T
CHAR~~L~~O~~T~~TETOWN
$\frac{11!}{2!2!}$
$= 9979200$

6. letter, letter, num, num, num, num

(a) $26 \times 26 \times 10 \times 10 \times 10 \times 10 = 6760000$

(b) $26 \times 25 \times 10 \times 9 \times 8 \times 7 = 3276000$

7. (a). ${}_{12}P_3 = 1320$

(b) $\frac{10!}{10} = 362880$

(c). ${}_{15}C_7 = 6435$

(d) ${}_{15}C_{12} = 455$

(e) ${}_{14}C_9 = 2002$

(f) ${}_{10}P_2 = 90$

(g) ${}_{50}P_3 = 117600$

8. (a) 1 10 45 120 210 252 210 120 45 10 1

(b). $(4a+5b)^4$:

$${}_4C_0(4a)^4(5b)^0 = 1(256a^4)(1) = 256a^4$$
$${}_4C_1(4a)^3(5b)^1 = 4(64a^3)5b = 1280a^3b$$
$${}_4C_2(4a)^2(5b)^2 = 6(16a^2)25b^2 = 2400a^2b^2$$
$${}_4C_3(4a)^1(5b)^3 = 4(4a)125b^3 = 2000ab^3$$
$${}_4C_4(4a)^0(5b)^4 = 1(1)625b^4 = 625b^4$$

$$256a^4 + 1280a^3b + 2400a^2b^2 + 2000ab^3 + 625b^4$$

(c) $\left(\frac{1}{2}a - 8b\right)^9$ 4th term is ${}_9C_3\left(\frac{1}{2}a\right)^3(-8b)^6$

$= 84\left(\frac{1}{8}a^3\right)262144b^6$

$2752512a^3b^6$

1

1 1

1 2 1

1 3 3 1

1 4 6 4 1

1 5 10 10 5 1

1 6 15 20 15 6 1

what is the fifth term in the expansion of: $\left(\frac{1}{9}x + 27\right)^7$

${}_7C_0$

${}_7C_1$

${}_7C_2$

${}_7C_3$

${}_7C_4\left(\frac{1}{9}x\right)^3(27)^4$

$35\left(\frac{1}{729}x^3\right)(531441)$

$25515x^3$

9. a) $15 \times 15 \times 15 \times 15 \times 15 = 759375$

b) 759375 combinations $\times$ 12 sec each $=$ 9112500 seconds

151875 min,
2531.25 hours

10. (a) ${}_{30}C_6 = 593775$

(b) 3 females and 3 males
${}_{17}C_3 \times {}_{13}C_3$
$= 680 \times 286$
$= 194480$

(c) Ajay, 2 males and 3 females
${}_{12}C_2 \times {}_{17}C_3$
$= 66 \times 680$
$= 44880$

11. 3 of 6 questions and two of three
${}_6C_3 \times {}_3C_2$
$= 20 \times 3$
$= 60$

12. C, Jim, Jer, Luciá, Lisa, Mel, Zyo

(a) __, Luciá, __, __, __, __, __
$6! = 720$

b) Lisa, __, __, __, __, Zyo, __
$5! = 120$

(c) __, __, __, 3 boys, 4 girls

All Boys followed by all girls
3 Boys and 4 girls
$3! \times 4! = 144$

1. $P(2) = 2^4 - 3(2)^3 - 5(2)^2 + 7(2) + 14$
$= 0$ $\therefore$ $x-2$ is a factor.

2. (a) $x^4 - x^3 - 2x^2$
$x^2(x^2 - x - 2)$
$\boxed{x^2(x-2)(x+1)}$

b) $x^3 + 5x^2 - 12$
$P(-2) = 0$
$\therefore x+2$ is factor

$$\begin{array}{r} x^2 + 3x - 6 \\ x+2 \overline{) x^3 + 5x^2 + 0x - 12} \\ \underline{x^3 + 2x^2} \\ 3x^2 + 0x \\ \underline{3x^2 + 6x} \\ -6x - 12 \\ \underline{-6x - 12} \\ 0 \end{array}$$

$\boxed{(x+2)(x^2+3x-6)}$

(c). $15x^4 - 22x^2 + 8$
$15x^4 - 10x^2 - 12x^2 + 8$
$5x^2(3x^2-2) - 4(3x^2-2)$
$(5x^2-4)(3x^2-2)$

Treat like a quadratic: add -22, mult 120, -10 & -12

(d) $6x^4 + 13x^3 - 8x^2 - 17x + 6$
$P(1) = 6 + 13 - 8 - 17 + 6$
$= 0$

$$\begin{array}{r} 6x^3 + 19x^2 + 11x - 6 \\ x-1 \overline{) 6x^4 + 13x^3 - 8x^2 - 17x + 6} \\ \underline{6x^4 - 6x^3} \\ 19x^3 - 8x^2 \\ \underline{19x^3 - 19x^2} \\ 11x^2 - 17x \\ \underline{11x^2 - 11x} \\ -6x + 6 \\ \underline{-6x + 6} \\ 0 \end{array}$$

$(x-1)(6x^3 + 19x^2 + 11x - 6)$

$P(-2) = 0$

$$\begin{array}{r} 6x^2 + 7x - 3 \\ x+2 \overline{) 6x^3 + 19x^2 + 11x - 6} \\ \underline{6x^3 + 12x^2} \\ 7x^2 + 11x \\ \underline{7x^2 + 14x} \\ -3x - 6 \\ \underline{-3x - 6} \\ 0 \end{array}$$

$(x-1)(x+2)(6x^2 + 7x - 3)$
$\boxed{(x-1)(x+2)(2x+3)(3x-1)}$

Hard Trinomial:
$6x^2 + 7x - 3$
$6x^2 + 9x - 2x - 3$
$3x(2x+3) - 1(2x+3)$
$(2x+3)(3x-1)$

(c) $x^3 - 17x^2 + 80x - 100$

$P(2) = 0$

$$\begin{array}{r} x^2 - 15x + 50 \\ x-2 \overline{) x^3 - 17x^2 + 80x - 100} \\ \underline{x^3 - 2x^2} \\ -15x^2 + 80x \\ \underline{-15x^2 + 30x} \\ 50x - 100 \\ \underline{50x - 100} \\ 0 \end{array}$$

$(x-2)(x^2 - 15x + 50)$

$(x-2)(x-5)(x-10)$

3. $f(x) = 2x^4 + 3x^3 - x^2 - 3x - 1$

$P(1) = 0$

$$\begin{array}{r} 2x^3 + 5x^2 + 4x + 1 \\ x-1 \overline{) 2x^4 + 3x^3 - x^2 - 3x - 1} \\ \underline{2x^4 - 2x^3} \\ 5x^3 - x^2 \\ \underline{5x^3 - 5x^2} \\ 4x^2 - 3x \\ \underline{4x^2 - 4x} \\ x - 1 \\ \underline{x - 1} \\ 0 \end{array}$$

$(x-1)(2x^3 + 5x^2 + 4x + 1)$

$P(-1) = 0$

$$\begin{array}{r} 2x^2 + 3x + 1 \\ x+1 \overline{) 2x^3 + 5x^2 + 4x + 1} \\ \underline{2x^3 + 2x^2} \\ 3x^2 + 4x \\ \underline{3x^2 + 3x} \\ x + 1 \\ \underline{x + 1} \\ 0 \end{array}$$

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

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

x-int: 1, -1, -½

4. $y = (x+4)^2 (x-1)^2 (x+1)$

a) degree = 5 (odd)

b) turning pts = 4

(c) end behaviour (lead coeff = +, degree = 5)

$x \to -\infty$ $\quad$ $x \to +\infty$

$y \to -\infty$ $\quad$ $y \to +\infty$

zeros:
-4, 1, -1

(d)

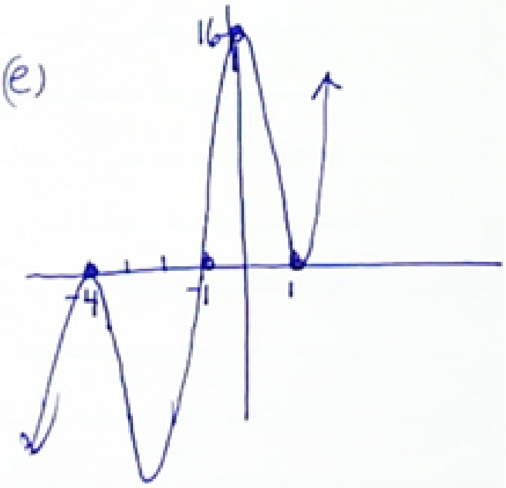
	$(x+4)^2$	$(x-1)^2$	$(x+1)$	
$(-\infty, -4)$	+	+	−	− neg
$(-4, -1)$	+	+	−	− neg
$(-1, 1)$	+	+	+	+ pos
$(1, \infty)$	+	+	+	+ pos

OR

positive
$(-1, 1)$ and $(1, \infty)$

neg
$(-\infty, -4)$ and $(-4, 1)$

(e)



5. $y = -x^4 + 2x^3 + 3x^2 - 4x - 4$

$y = -1(x^4 - 2x^3 - 3x^2 - 4x - 4)$ * factor theorem

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

(a) degree 4

(b) turning points = 3

(c) End behaviour lead coeff = neg

deg = +

$x \to -\infty$ $x \to \infty$

$y \to -\infty$ $y \to -\infty$

zeros

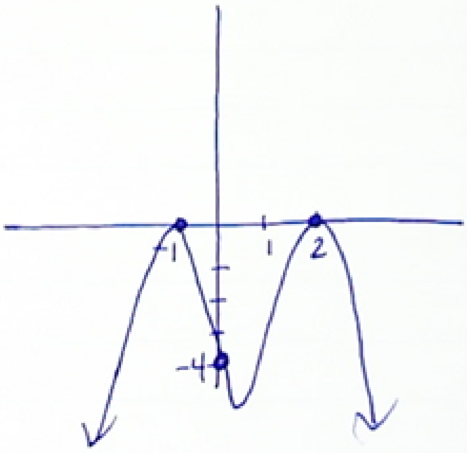
-1, 2

(d)

	-1	$(x+1)^2$	$(x-2)^2$	y
$(-\infty,-1)$	−	+	+	− neg
$(-1,2)$	−	+	+	− neg
$(2,\infty)$	−	+	+	− neg

x-int −1 and 2

y-int −4



or neg $(-\infty,-1)$

$(-1,2)$

$(2,\infty)$

6. (a) Intercepts: −3, 1, 7

$y = a(x+3)(x-1)(x-7)$

pt (2,30)

$30 = a(2+3)(2-1)(2-7)$

$30 = a(5)(1)(-5)$

$30 = -25a$

$\frac{30}{-25} = a$

$-6/5 = a$ $\quad y = \frac{-6}{5}(x+3)(x-1)(x-7)$

(b). Intercepts: −5, −1, 2, 4

just touches

$y = a(x+5)(x+1)^2(x-2)(x-4)$

$20 = a(0+5)(0+1)^2(0-2)(0-4)$

$20 = a(5)(1)(-2)(-4)$

$20 = a(40)$

$\frac{20}{40} = a$

$a = 0.5$

$y = 0.5(x+5)(x+1)^2(x-2)(x-4)$

Unit 4

1.(a). $f(x)=\frac{x^2-4x-12}{x-6}$; $f(x)=\frac{\cancel{(x-6)}(x+2)}{\cancel{x-6}}$ POD $x=6$ $(6,8)$

(b) $f(x)=\frac{x^2+7x-18}{x-3}$; $f(x)=\frac{(x+9)(x-2)}{(x-3)}$ VA $x=3$

(c) $f(x)=\frac{x^3-6x^2+11x-6}{x^2+2x-15}$; $f(x)=\frac{(x-1)(x-2)\cancel{(x-3)}}{(x+5)\cancel{(x-3)}}$ VA $x=-5$ POD $x=3$ $(3,\frac{2}{8})$

(d) $f(x)=\frac{6x^2-x-12}{x^2-36}$; $f(x)=\frac{(3x+4)(2x-3)}{(x-6)(x+6)}$ VA $x=6$, $x=-6$

2. (a) 2
(b) $5/3$
(c) $1/0$ ∴ DNE
(d) $0/2=0$
(e) $9/3=3$

3.(a) $f(x)=\frac{x^2+8x-20}{x^2+x-6}$; $f(x)=\frac{(x+10)\cancel{(x-2)}}{(x+3)\cancel{(x-2)}}$
VA $x=-3$
HA $y=1$
POD $x=2$ $(2,\frac{12}{5})$

3(b) $f(x)=\frac{x^2-3x-40}{2x^2+7x-4}$

$f(x)=\frac{(x-8)(x+5)}{(2x-1)(x+4)}$

VA $x=\frac{1}{2}$ $x=-4$
HA $y=\frac{1}{2}$

(c). $f(x)=\frac{x^4-2x^3-63x^2}{x^2-10x+16}$

$f(x)=\frac{x^2(x-9)(x+7)}{(x-8)(x-2)}$

VA : $x=8$, $x=2$
HA —

(d) $f(x)=\frac{2x^3-18x}{x^3-x^2-2x}$

$f(x)=\frac{2\cancel{x}(x-3)(x+3)}{\cancel{x}(x-2)(x+1)}$

VA $x=2$, $x=-1$
HA $y=2$
POD $x=0$ $(0,\frac{-9}{-2})$
$(0,\frac{9}{2})$

4.(a) $f(x)=\frac{x^2+8x+12}{x+5}$; $f(x)=x+3+\frac{-3}{x+5}$

$$\begin{array}{r} x+3 \\ x+5\overline{)x^2+8x+12} \\ \underline{x^2+5x} \\ 3x+12 \\ \underline{3x+15} \\ -3 \end{array}$$

Slant asy $y=x+3$

4. (b) $f(x) = \frac{x^2+4}{x-6}$; $f(x) = x+6+\frac{40}{x-6}$

$$\begin{array}{r} x+6 \\ x-6\overline{)x^2+0x+4} \\ \underline{x^2-6x} \\ 6x+4 \\ \underline{6x-36} \\ 40 \end{array}$$

slant asy $y = x+6$

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

$$\begin{array}{r} 2x \\ x+2\overline{)2x^2+4x-5} \\ \underline{2x^2+4x} \\ -5 \end{array}$$

slant asy $y = 2x$

5. (a) $f(x) = \frac{x^2-2x+6}{x+1}$; $f(x) = x-3+\frac{9}{x+1}$

slant asy $y = x-3$

VA $x = -1$

HA —

(b) $f(x) = \frac{x^2+3x-28}{x+7}$; $f(x) = \frac{\cancel{(x+7)}(x-4)}{\cancel{(x+7)}}$

VA —

HA —

POD: $x = -7$ $(-7,-11)$

(c) $f(x) = \frac{x^2+9x+18}{x+4}$; $f(x) = \frac{(x+6)(x+3)}{x+4}$; $f(x) = x+5+\frac{-2}{x+4}$

VA $x = -4$

HA —

slant = $y = x+5$

(d) $f(x) = \frac{x^2-10x+21}{x-3}$; $f(x) = \frac{(x-7)\cancel{(x-3)}}{\cancel{(x-3)}}$

POD $x = 3$ $(3,-4)$

(e) $f(x) = \frac{2x^2+1}{x^2-4x-45}$; $f(x) = \frac{2x^2+1}{(x-9)(x+5)}$

VA $x = 9, x = -5$

HA $y = 2$

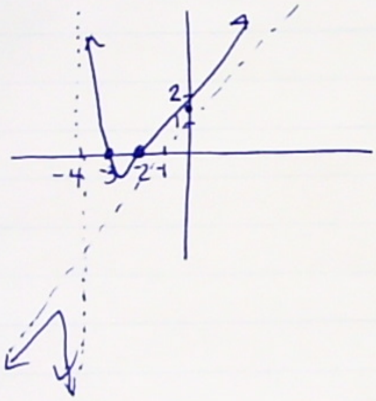
(f) $f(x) = \frac{4x+8}{3x^2+8x+4}$; $f(x) = \frac{4x+8}{(3x+2)(x+2)}$

VA $x = -2/3$ $x = -2$

HA —

6. (a) $f(x) = \frac{x^2+5x+6}{x+4}$; $f(x) = \frac{(x+3)(x+2)}{x+4}$; $f(x) = x+1+\frac{2}{x+4}$

X-int : -3, -2
y-int : 6/4
VA $x=-4$
HA —
POD —
Slant $y=x+1$

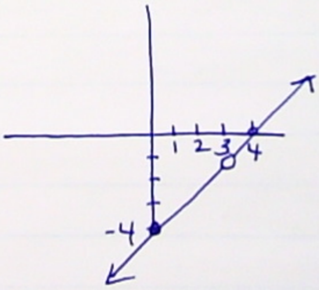


Behaviour

-4.1	-3.9
$\frac{-\,-}{-}$	$\frac{-\,-}{+}$
$-\infty$	$+\infty$

(b). $f(x) = \frac{x^2-7x+12}{x-3}$; $f(x) = \frac{\cancel{(x-3)}(x-4)}{\cancel{(x-3)}}$

x-int : 4
y-int : -4
VA —
HA —
POD $x=3$ (3, -1)

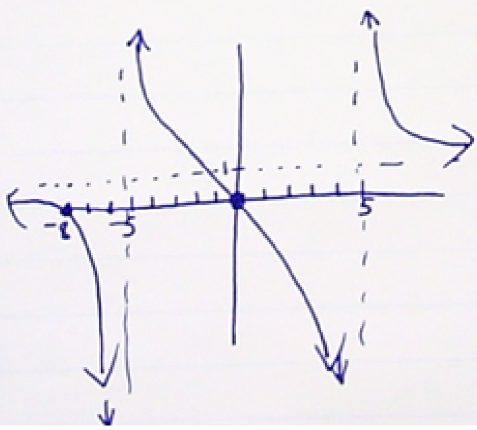


(c). $f(x) = \frac{x^2+8x}{x^2-25}$; $f(x) = \frac{x(x+8)}{(x-5)(x+5)}$

x-int: 0, -8
y-int: 0
VA $x=5, x=-5$
HA $y=1$

Behaviour

-5.1	-4.9	4.9	5.1
$\frac{-\,+}{-\,-}$	$\frac{-\,+}{-\,+}$	$\frac{+\,+}{-\,+}$	$\frac{+\,+}{+\,+}$
$-\infty$	$+\infty$	$-\infty$	$+\infty$



7. (a) $\frac{2a-3}{a-3} - 2 = \frac{12}{a+3}$ $(a-3)(a+3)$

$(2a-3)(a+3) - 2(a-3)(a+3) = 12(a-3)$

$2a^2+3a-9-2(a^2-9) = 12a-36$

$\cancel{2a^2}+3a-9-\cancel{2a^2}+18 = 12a-36$

$3a-12a = -36-9$

$-9a = -45$

$a = 5$

b. $\frac{K}{K^2-8K+12} = \frac{K}{K-2} + \frac{1}{K-6}$

$\frac{K}{(K-6)(K-2)} = \frac{K}{K-2} + \frac{1}{K-6}$

$K = K(K-6) + 1(K-2)$

$K = K^2-6K+K-2$

$K = K^2-5K-2$

$0 = K^2-6K-2$

$\frac{6\pm\sqrt{44}}{2} = 6.3,\ -0.3$

(c) $x - \frac{2}{x-3} = \frac{x-1}{3-x}$

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

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

$x^2-3x-2 = -x+1$

$x^2-2x-3=0$

$(x-3)(x+1)=0$

$x = 3, -1$

inadmissible

(d) $\frac{2m}{m-1} + \frac{m-5}{(m-1)(m+1)} = 1$ $(m-1)(m+1)$

$2m(m+1)+(m-5) = 1(m-1)(m+1)$

$2m^2+2m+m-5 = m^2-1$

$2m^2+3m-5 = m^2-1$

$m^2+3m-4 = 0$

$(m+4)(m-1)=0$

$m = -4, 1$

inadmis.

8. (a) $\sqrt{-3x+4}^2 = (2-x)^2$

$-3x+4 = 4-4x+x^2$

$0 = x^2-x$

$0 = x(x-1)$

$x=0;\ x=1$

(b) $\sqrt{x-5} = 11-\sqrt{x+6}$

$\sqrt{x-5}^2 = (11-\sqrt{x+6})^2$

$x-5 = 121-22\sqrt{x+6}+x+6$

$\cancel{x}-5 = 127+\cancel{x}-22\sqrt{x+6}$

$-132 = -22\sqrt{x+6}$

$6^2 = \sqrt{x+6}^2$

$36 = x+6$

$30 = x$

c). $\sqrt{x+7} + \sqrt{x+4} = 11$

$\sqrt{x+7}^2 = (11-\sqrt{x+4})^2$

$\cancel{x}+7 = 121 - 22\sqrt{x+4} + \cancel{x}+4$

$-118 = -22\sqrt{x+4}$

$\left(\frac{118}{22}\right)^2 = (\sqrt{x+4})^2$

$\frac{13924}{484} = x+4$

$\frac{2997}{121} = x$

(d) $\sqrt{y+3} - \sqrt{2y-8} = 1$

$(\sqrt{y+3})^2 = (1+\sqrt{2y-8})^2$

$y+3 = 1 + 2\sqrt{2y-8} + 2y - 8$

$y+3 = 2y - 7 + 2\sqrt{2y-8}$

$(-y+10)^2 = (2\sqrt{2y-8})^2$

$y^2 - 20y + 100 = 4(2y-8)$

$y^2 - 20y + 100 = 8y - 32$

$y^2 - 28y + 132 = 0$

$(y-22)(y-6) = 0$

$y = 22$; $y = 6$

* $y+3 \geq 0$ — $y \geq -3$

* $2y-8 \geq 0$ — $2y \geq 8$ — $y \geq 4$

9. (a) $y = x^2 - 5$

Inv $x = y^2 - 5$

$x + 5 = y$

$\sqrt{x+5} = y$

(b) $y = 10 + \sqrt{2x-1}$

Inv: $x = 10 + \sqrt{2y-1}$

$x - 10 = \sqrt{2y-1}$

$(x-10)^2 = 2y - 1$

$(x-10)^2 + 1 = 2y$

$\frac{(x-10)^2+1}{2} = y$

OR $\frac{x^2-20x+101}{2} = y$

(c) $y = 3(x-4)^2 - 9$

inv $x = 3(y-4)^2 - 9$

$x + 9 = 3(y-4)^2$

$\frac{x+9}{3} = (y-4)^2$

$\sqrt{\frac{x+9}{3}} = y - 4$

$\sqrt{\frac{x+9}{3}} + 4 = y$

(d) $y = x^2 - 8x + 13$

$x = y^2 - 8y + 13$

$x = y^2 - 8y + 16 - 16 + 13$

$x = (y^2 - 8y + 16) - 16 + 13$

$x = (y-4)^2 - 3$

$x + 3 = (y-4)^2$

$\sqrt{x+3} = y - 4$

$\sqrt{x+3} + 4 = y$

(e) $y = \frac{3x-5}{x+4}$

Inv:

$x = \frac{3y-5}{y+4}$

$x(y+4) = 3y - 5$

$xy + 4x = 3y - 5$

$xy - 3y = -4x - 5$

$y(x-3) = -4x - 5$

$y = \frac{-4x-5}{x-3}$

(f) $y = \frac{9+x}{3x-2}$

Inv:

$x = \frac{9+y}{3y-2}$

$x(3y-2) = 9 + y$

$3xy - 2x = 9 + y$

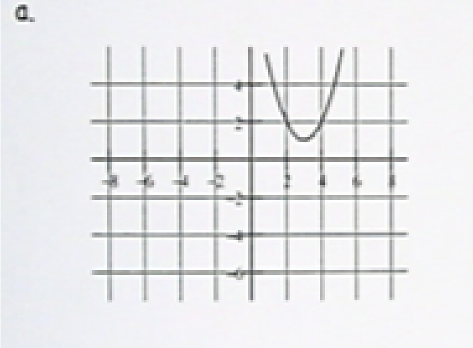
$3xy - y = 2x + 9$

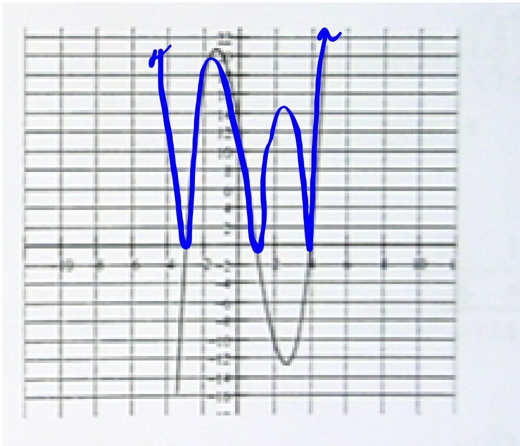
$y(3x-1) = 2x + 9$

$y = \frac{2x+9}{3x-1}$

10.

a.



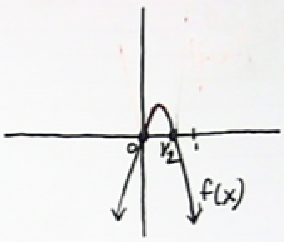


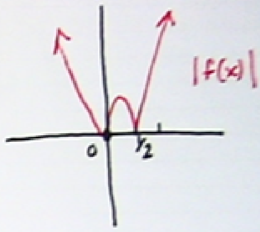
11. a $f(x) = -4x^2 + 2x$

$f(x) = -2x(2x-1)$

x-int: $0, \frac{1}{2}$

y-int: 0





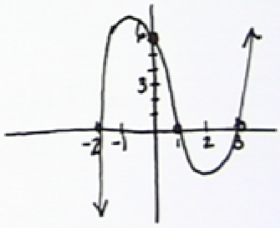
	$-2x$	$(2x-1)$	
$(-\infty, 0)$	+	−	neg
$(0, \frac{1}{2})$	−	−	pos
$(\frac{1}{2}, \infty)$	−	+	neg

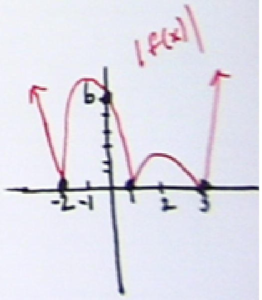
b) $f(x) = x^3 - 2x^2 - 5x + 6$

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

x-int $-2, 1, 3$

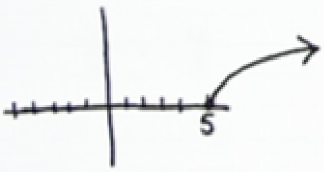
y-int 6





	$(x+2)$	$(x-1)$	$(x-3)$	
$(-\infty, -2)$	−	−	−	− neg
$(-2, 1)$	+	−	−	+ pos
$(1, 3)$	+	+	−	− neg
$(3, \infty)$	+	+	+	+ pos

(c). $f(x) = \sqrt{x-5}$



(d) $f(x) = \frac{2x^2+x-8}{x^2+x-6}$; $\frac{2x^2+x-8}{(x+3)(x-2)}$

QF $\frac{-1 \pm \sqrt{65}}{4}$

1.77 -2.27

x-int: $1.77, -2.27$

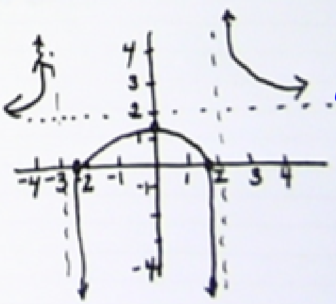
y-int: $-8/-6 = 4/3$

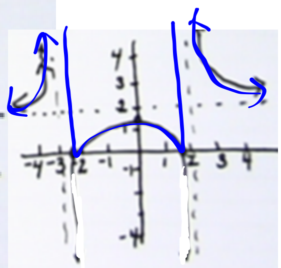
VA $x = -3, 2$

HA $y = 2$

Behaviour

-3.1	-2.9	1.9	2.1
$+/-$	$+/+-$	$+/+-$	$+/++$
$+\infty$	$-\infty$	$-\infty$	$+\infty$





(e) $f(x) = \frac{x^2+4x+1}{x+3}$; $f(x) = x+1+\frac{-2}{x+3}$

$$\begin{array}{r} x+1 \\ x+3\overline{)x^2+4x+1} \\ \underline{x^2+3x} \\ x+1 \\ \underline{x+3} \\ -2 \end{array}$$

x-int: $\frac{-4 \pm \sqrt{12}}{2}$ < -0.27, -3.73

y-int: $1/3$

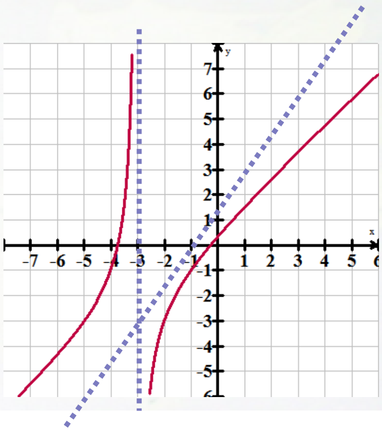
VA: $x = -3$

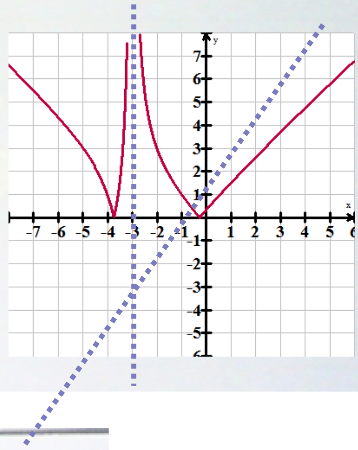
HA —

Slant $y = x+1$

Behaviour

-3.1	-2.9
-/-	-/+
$+\infty$	$-\infty$





12. (a) $|2x-5| = 7$

$2x-5=7$ $2x-5=-7$

$2x=12$ $2x=-2$

$x=6$ $x=-1$

b. $|x-12| \geq -6$

$x \in \mathbb{R}$

c. $|3x+1| < 15$

$3x+1 < 15$ or $3x+1 > -15$

$3x < 14$ $3x > -16$

$x < 14/3$ $x > -16/3$

$\frac{-16}{3} < x < \frac{14}{3}$

d. $|x^2-12| = 13$

$x^2-12=13$ $x^2-12=-13$

$x^2-25=0$ $x^2+1=0$

$(x-5)(x+5)=0$ No sol'n

$x = 5, -5$

1\. a. $\lim\limits_{x\to 5} \dfrac{x^3-125}{x^2-25}$

$\lim\limits_{x\to 5} \dfrac{\cancel{(x-5)}(x^2+5x+25)}{\cancel{(x-5)}(x+5)}$

$= \dfrac{5^2+5(5)+25}{5+5}$

$= \dfrac{25+25+25}{10}$

$= 75/10$

b. $\lim\limits_{x\to\infty} 7+\dfrac{5}{x}-\dfrac{x^3}{3x^3-2}$

$7+0-1/3$

$= 20/3$

c. $\lim\limits_{x\to 3} \dfrac{x^2+x-12}{x^3+2x^2-11x-12}$

$\lim\limits_{x\to 3} \dfrac{(x+4)\cancel{(x-3)}}{\cancel{(x-3)}(x+4)(x+1)}$

$= \dfrac{7}{7(4)}$

$= 1/28$

d. $\lim\limits_{x\to\infty} \left(\dfrac{4}{3}\right)^x$

$= \infty$

e. $\lim\limits_{x\to 5} \dfrac{\sqrt{3x+1}-4}{5-x} \times \dfrac{\sqrt{3x+1}+4}{\sqrt{3x+1}+4}$

$\lim\limits_{x\to 5} \dfrac{(3x+1)-16}{(5-x)(\sqrt{3x+1}+4)}$

$\lim\limits_{x\to 5} \dfrac{3x-15}{(5-x)(\sqrt{3x+1}+4)}$

$\lim\limits_{x\to 5} \dfrac{3\cancel{(x-5)}^{-1}}{\cancel{(5-x)}(\sqrt{3x+1}+4)}$

$\lim\limits_{x\to 5} \dfrac{-3}{\sqrt{3x+1}+4}$

$\dfrac{-3}{\sqrt{16}+4} = -3/8$

f. $\lim\limits_{x\to -4} \dfrac{16-x^2}{3x^2+10x-8}$

$\lim\limits_{x\to -4} \dfrac{(4-x)\cancel{(4+x)}}{(3x-2)\cancel{(x+4)}}$

$= \dfrac{8}{-14}$

g. $\lim\limits_{x\to\infty} \dfrac{(x-7)(2x-3)}{10-3x^2}$

$\lim\limits_{x\to\infty} \dfrac{2x^2-17x+21}{10-3x^2}$

$= -2/3$

h. $\lim\limits_{x\to 4} \dfrac{x-4}{\sqrt{x+12}-\sqrt{4x}} \times \dfrac{\sqrt{x+12}+\sqrt{4x}}{\sqrt{x+12}+\sqrt{4x}}$

$\lim\limits_{x\to 4} \dfrac{(x-4)(\sqrt{x+12}+\sqrt{4x})}{(x+12)-(4x)}$

$\lim\limits_{x\to 4} \dfrac{(x-4)(\sqrt{x+12}-\sqrt{4x})}{-3x+12}$

$\lim\limits_{x\to 4} \dfrac{\cancel{(x-4)}(\sqrt{x+12}+\sqrt{4x})}{-3\cancel{(x-4)}}$

$= \dfrac{\sqrt{16}+\sqrt{16}}{-3} = 8/-3$

i. $\lim\limits_{x\to -6} \dfrac{6x^2-12x}{6-x}$

$= \dfrac{216+72}{12}$

$= \dfrac{280}{12}$

j. $\lim\limits_{x\to -\infty} 12-\left(\dfrac{2}{5}\right)^x$

$12-\left(\dfrac{2}{5}\right)^{-\infty}$

$12-\left(\dfrac{5}{2}\right)^{\infty}$

$-\infty$

k. $\lim\limits_{x\to \pi/3} \sin^2 x$

$\sin^2 \pi/3$

$\left(\dfrac{\sqrt{3}}{2}\right)^2$

$3/4$

l. $\lim\limits_{x\to 12} \dfrac{\frac{1}{x-6}-\frac{1}{6}}{x^2-144}$ $6(x-6)$ $6(x-6)$ $6(x-6)$

$\lim\limits_{x\to 12} \dfrac{6-(x-6)}{6(x-6)(x^2-144)}$

$\lim\limits_{x\to 12} \dfrac{6-x+6}{6(x-6)(x-12)(x+12)}$

$\lim\limits_{x\to 12} \dfrac{\cancel{12-x}^{\,-1}}{6(x-6)\cancel{(x-12)}(x+12)}$

$\lim\limits_{x\to 12} \dfrac{-1}{6(x-6)(x+12)}$

$\dfrac{-1}{6(6)(24)}$

$= 864$

m. $\lim\limits_{x\to 0} \dfrac{\sin x\cos x-\sin^2 x}{\sin x}$

$\lim\limits_{x\to 0} \dfrac{\sin x(\cos x-\sin x)}{\sin x}$

$= \cos 0-\sin 0$

$= 1-0$

$= 1$

o. $\lim\limits_{x\to -\infty} \dfrac{5x^6-9x^2}{x^2-4x^6}$

$= \dfrac{5}{-4}$

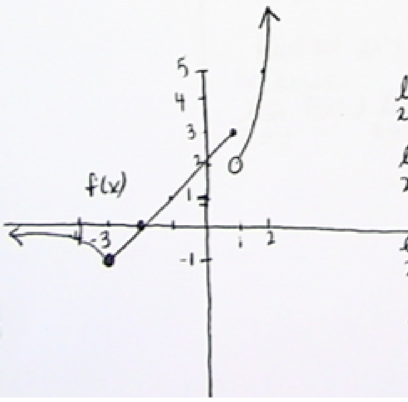
p. $\lim\limits_{x\to 7^-} \dfrac{3+2x}{x-7}$

$-\infty$

6.9 | +/- | $-\infty$

(7 from left)

2.



$\lim\limits_{x\to -3^-} f(x) = -1$

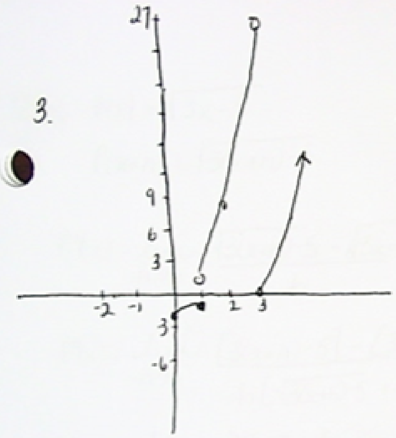
$\lim\limits_{x\to -3^+} f(x) = -1$

$\lim\limits_{x\to 1^-} f(x) = 3$

$\lim\limits_{x\to -1^+} f(x) = 1$

Discontinuous at $x=-1$ because $\lim\limits_{x\to -1^-} f(x) \neq \lim\limits_{x\to -1^+} f(x)$

3.

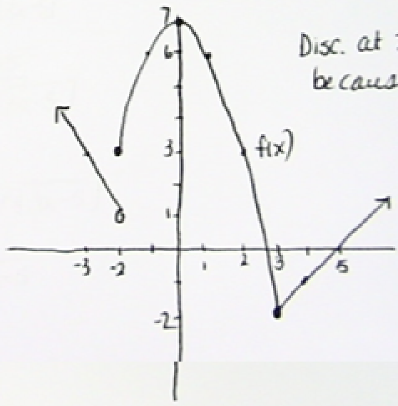


Disc.
at $x=1$ because $\lim_{x\to 1^-} g(x) \neq \lim_{x\to 1^+} g(x)$

at $x=3$ because $\lim_{x\to 3^-} g(x) \neq \lim_{x\to 3^+} g(x)$

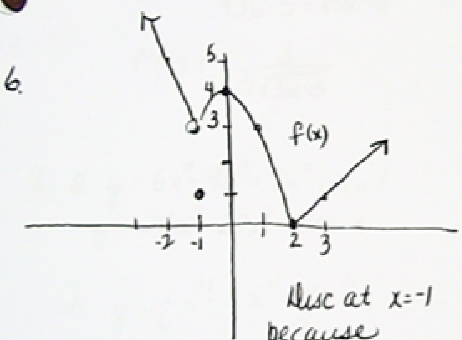
4.
a. 1 f. 0
b. 2 g. 1
c. DNE h. 1
d. 0 i. 1
e. 0 j. -3

5.



Disc. at $x=-2$
because $\lim_{x\to -2^-} f(x) \neq \lim_{x\to -2^+} f(x)$

6.



Disc at $x=-1$
because
$\lim_{x\to -1^-} f(x) \neq \lim_{x\to -1^+} f(x)$

7. (a) $f(x)=$

$f(x+h) = 5(x+h)^2 + 6(x+h) - 2$

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

$\lim_{h\to 0} \dfrac{5(x+h)^2 + 6(x+h) - 2 - (5x^2 + 6x - 2)}{h}$

$\lim_{h\to 0} \dfrac{5(x^2+2xh+h^2) + 6x + 6h - 2 - 5x^2 - 6x + 2}{h}$

$\lim_{h\to 0} \dfrac{\cancel{5x^2} + 10xh + 5h^2 + \cancel{6x} + 6h \cancel{-2} \cancel{-5x^2} \cancel{-6x} \cancel{+2}}{h}$

$\lim_{h\to 0} \dfrac{\cancel{h}(10x + 5h + 6)}{\cancel{h}}$

$f'(x) = 10x + 5(0) + 6$
$= 10x + 6$

7.(b) $f(x) = \sqrt{3x-5}$

$f(x+h) = \sqrt{3(x+h)-5}$

$$f'(x) = \lim_{h \to 0} \frac{\sqrt{3(x+h)-5} - \sqrt{3x-5}}{h} \times \frac{\sqrt{3(x+h)-5} + \sqrt{3x-5}}{\sqrt{3(x+h)-5} + \sqrt{3x-5}}$$

$$f'(x) = \lim_{h \to 0} \frac{[3(x+h)-5] - [3x-5]}{h\left[\sqrt{3(x+h)-5} + \sqrt{3x-5}\right]}$$

$$f'(x) = \lim_{h \to 0} \frac{\cancel{3x} + 3h \cancel{-5} \cancel{-3x} \cancel{+5}}{h\left[\sqrt{3(x+h)-5} + \sqrt{3x-5}\right]}$$

$$f'(x) = \lim_{h \to 0} \frac{3\cancel{h}}{\cancel{h}\left[\sqrt{3(x+h)-5} + \sqrt{3x-5}\right]}$$

$$\lim_{h \to 0} \frac{3}{\sqrt{3(x+h)-5} + \sqrt{3x-5}}$$

$$f'(x) = \frac{3}{\sqrt{3x-5} + \sqrt{3x-5}}$$

$$f'(x) = \frac{3}{2\sqrt{3x-5}}$$

8.(a) $y = 6x^4 - 9x^3 + 7x^2 - 6x + 1$

$y' = 24x^3 - 27x^2 + 14x - 6$

(b) $y = \frac{1}{6}x^{18} - \frac{3}{4}x^{12} + 14x - 6$

$y' = 3x^{17} - 9x^{11} + 14$

(c) $f(x) = -24x^7 + 12x^5 - 6$

$f'(x) = -168x^6 + 60x^4$

(d) $f(x) = 2x^{-4} - 9\sqrt{2}x^3 + x^2 - 12x + x^{\frac{1}{2}}$

$f'(x) = -8x^{-5} - 27\sqrt{2}x^2 + 2x - 12 + \frac{1}{2}x^{-\frac{1}{2}}$

(e). $y = (7x^3 - 9x)(2x^2 + 4)$

$y' = (7x^3 - 9x)(4x) + (2x^2 + 4)(21x^2 - 9)$

(f). $y = \frac{(-x^4 + 8x^2 - x)}{(x^3 - 4x)}$

$y' = \frac{(x^3 - 4x)(-4x^3 + 16x - 1) - (-x^4 + 8x^2 - x)(3x^2 - 4)}{(x^3 - 4x)^2}$

(g) $y = (3x^2 - 6x + 2)^5$

$y' = 5(3x^2 - 6x + 2)^4(6x - 6)$

(h) $f(x) = (4x^3 + (x^2 - 1)^{-2})^6$

$f(x) = 6(4x^3 + (x^2 - 1)^{-2})^5(12x^2 - 2(x^2 - 1)^{-3}2x)$

(i) $f(x) = x^{3/4}(x - 2x^2)^{1/2}$

$f'(x) = x^{3/4} \cdot \frac{1}{2}(x - 2x^2)^{-1/2}(1 - 4x) + (x + 2x^2)^{1/2} \cdot \frac{3}{4}x^{-1/4}$

(j). $f(x) = \frac{2}{(3x^4 + 4x^2)^3}$

$f(x) = 2(3x^4 + 4x^2)^{-3}$

$f'(x) = -6(3x^4 + 4x^2)^{-4}(12x^3 + 8x$

9. $f(x) = 5x^3 - 6x^2 + 7x - 8 \quad (1, -2)$

$f'(x) = 15x^2 - 12x + 7$

$m_{x=1} = 15(1)^2 - 12(1) + 7$

$m = 10$

$y + 2 = 10(x - 1)$

$y + 2 = 10x + 10$

$y = 10x + 8$

10. $f(x) = 12x^{1/2} - 6x$ at $x = 4$

$f'(x) = 6x^{-1/2} - 6$

$m = 6(4)^{-1/2} - 6$

$= 6\frac{1}{4^{1/2}} - 6$

$= \frac{6}{2} - 6$

$m = -3$

$y = 12(4)^{1/2} - 6(4)$

$24 - 24$

$y = 0$

$(4, 0)$

$y - 0 = -3(x - 4)$

$y = -3x + 12$

11. $f(x) = 3x^2 - 12x^{-1} \quad (2, 6)$

$f'(x) = 6x + 12x^{-2}$

$m = 6(2) + 12(2)^{-2}$

$= 12 + 12 \cdot \frac{1}{2^2}$

$= 12 + 3$

$m = 15$

$y - 6 = 15(x - 2)$

$y - 6 = 15x - 30$

$y = 15x - 24$

12. $y = 5x^4 - 40x^2 + 75$

$y' = 20x^3 - 80x$

slope of horizontal line is 0

$20x^3 - 80x = 0$

$20x(x^2 - 4) = 0$

$20x(x - 2)(x + 2) = 0$

$x = 0, 2, -2$

To find pts sub $x = 0, 2, -2$ into original $y = 5x^4 - 40x^2 + 75$

$x = -2 \quad y = 80 - 160 + 75 = 5$

$x = 0 \quad y = 0 - 0 + 75 = 75$

$x = 2 \quad y = 80 - 160 + 75 = 5$

$(-2, 5) \; (0, 75) \; (2, 5)$

13 $y = \frac{1}{4}(x^2+5x)^2$ at $x = -2$ $\rightarrow$ $y = \frac{1}{4}(4-10)^2$

$y' = \frac{2}{4}(x^2+5x)(2x+5)$ $y = \frac{1}{4}(-6)^2$

$y = 9$

$m_{x=-2} = \frac{1}{2}(4-10)(-4+5)$

$= \frac{1}{2}(-6)(1)$

$= -3$

$m = -3$ $(-2, 9)$

$y - 9 = -3(x+2)$

$y = -3x - 6 + 9$

$y = -3x + 3$

14. $f(x) = (x - x^2)(x^3-2)^{1/2}$ at $x = 3$

$f'(x) = (x - x^2)\frac{1}{2}(x^3-2)^{-1/2} \cdot 3x^2 + (x^3-2)^{1/2}(1-2x)$

$m_{x=3} = (3-9)\frac{1}{2}(25)^{-1/2} \cdot 27 + (25)^{1/2}(-5)$

$(-6)(\frac{1}{2})(\frac{1}{5})(27) + 5(-5)$

$-\frac{162}{10} - 25$

$-\frac{81}{5} - \frac{125}{5}$

$= -206$

15. $f(x) = x^{3/2}$ parallel to $6x - y = 10$

$6x - 10 = y$

$m = 6$

$f'(x) = \frac{3}{2}x^{1/2}$

Set $\frac{3}{2}x^{1/2} = 6$

$3\sqrt{x} = 12$

$\sqrt{x} = 4$

$x = 16$

sub $x = 16$ into original

$x = 16$ $y = 16^{3/2}$

$= 64$

$(16, 64)$

9. $f(x) = 5x^3 - 6x^2 + 7x - 8 \quad (1, -2)$

$f'(x) = 15x^2 - 12x + 7$

$m_{x=1} = 15(1)^2 - 12(1) + 7$

$m = 10$

$y + 2 = 10(x - 1)$

$y + 2 = 10x + 10$

$y = 10x + 8$

10. $f(x) = 12x^{1/2} - 6x$ at $x = 4$

$f'(x) = 6x^{-1/2} - 6$

$m = 6(4)^{-1/2} - 6$

$= 6\frac{1}{4^{1/2}} - 6$

$= \frac{6}{2} - 6$

$m = -3$

$y = 12(4)^{1/2} - 6(4)$

$24 - 24$

$y = 0$

$(4, 0)$

$y - 0 = -3(x - 4)$

$y = -3x + 12$

11. $f(x) = 3x^2 - \frac{12}{x}$ at $(2, 6)$

$f(x) = 3x^2 - 12x^{-1}$

$f'(x) = 6x + 12x^{-2}$

$m_{x=2} = 6(2) + 12(2)^{-2}$

$12 + 12\left(\frac{1}{2^2}\right)$

$12 + 12 \times \frac{1}{4}$

$= 12 + 3$

$= 15$

$m = 15 \quad (2, 6)$

$y - 6 = 15(x - 2)$

$y - 6 = 15x - 30$

$y = 15x - 24$

12. $f(x) = 5x^4 - 40x^2 + 75$

tangent is horizontal

$\therefore$ slope $= 0$

$f'(x) = 20x^3 - 80x$

set $m = 0$

$20x^3 - 80x = 0$

$20x(x^2 - 4) = 0$

$20x(x - 2)(x + 2) = 0$

$x = 0, 2, -2$

sub x's into original to get points

$f(x) = 5x^4 - 40x^2 + 75$

$x = -2 \quad y = 5(-2)^4 - 40(-2)^2 + 75 = -5$

$x = 0 \quad y = 5(0)^4 - 40(0)^2 + 75 = 75$

$x = 2 \quad y = 5(2)^4 - 40(2)^2 + 75 = -5$

$(-2, -5) \quad (0, 75) \quad (2, -5)$

13. $f(x) = x^{3/2}$ parallel to $6x - y = 10$

$f'(x) = \frac{3}{2}x^{1/2}$

$6x - 10 = y$

$m = 6$

set $\frac{3}{2}x^{1/2} = 6$

$3x^{1/2} = 12$

$x^{1/2} = 4$

$x = 16$

sub $x = 16$ into original

$y = 16^{3/2}$

$y = 64$

Extra Inverse of log and exponential functions