17) $(1+i)^2-(7-4i)^2+i^3$ (Verify your answer using your calculator.)

$(1+2i+i^2)-(49-56i+16i^2)+(-i)$

$\cancel{1}+2i\,\cancel{-1}-49+56i-\cancel{16}^{16}(-1)-i$

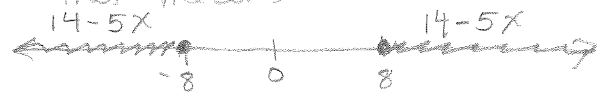
$\boxed{-33+57i}$

Recall i-cycle:

$i^1=i$
$i^2=-1$
$i^3=-i$
$i^4=1$

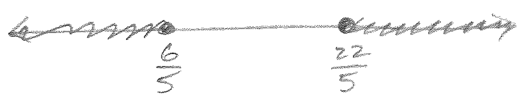
18) $|14-5x|\geq 8$

This means:



so:

$14-5x\leq -8$	OR	$14-5x\geq 8$
$+5x\quad +5x$		$+5x\quad +5x$
$14\leq 5x-8$		$14\geq 5x+8$
$+8\quad +8$		$-8\quad -8$
$\frac{22}{5}\leq\frac{5x}{5}$		$\frac{6}{5}\geq\frac{5x}{5}$
$\frac{22}{5}\leq x$	OR	$\frac{6}{5}\geq x$



$x\leq\frac{6}{5}$ or $x\geq\frac{22}{5}$

19) $H(x)=\dfrac{x^2-4x-5}{2x^2-5x-3}$ ⇐ can't equal zero: $2x^2-5x-3=0$

$x=\dfrac{5\pm\sqrt{25-4\cdot2\cdot3}}{2(2)}$

$x=\dfrac{5\pm\sqrt{1}}{4}$

$x=\dfrac{5\pm1}{4}\Rightarrow\frac{3}{2}$ or 1

Domain: all Real Numbers except 1 or $\frac{3}{2}$.

Zeros: Numerator $=0$ (if in domain)

$x^2-4x-5=0$

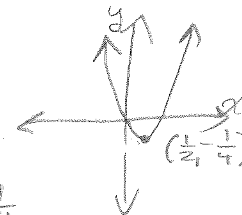
$(x-5)(x+1)=0$

$x=5$ or $x=-1$ ⇒ zeros $-1, 5$ $(-1,0),(5,0)$

y-intercept: $H(0)=\dfrac{0^2-4\cdot0-5}{2\cdot0^2-5\cdot0-3}=\dfrac{-5}{-3}=\dfrac{5}{3}$ $(0,\frac{5}{3})$

20) $f(x) = x^2 - x$ Domain: All Real Numbers

Find vertex: Range: $y \geq -\frac{1}{4}$



Vertex $x = \frac{-b}{2a} = \frac{-(-1)}{2(1)} = \frac{1}{2}$

Vertex $y = f(\frac{1}{2}) = (\frac{1}{2})^2 - \frac{1}{2} = \frac{1}{4} - \frac{1}{2} = -\frac{1}{4}$

21) $27x^3 + 64$ Use sum of cubes factoring pattern

$$a^3 + b^3 = (a+b)(a^2 - ab + b^2)$$

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

$$= (3x+4)(9x^2 - 12x + 16)$$

22) $a_5 = 6$ $a_{11} = 36$

a) find d using: $a_n = a_k + (n-k)(d)$

use $n = 11$, $k = 5$: $a_{11} = a_5 + (11-5)(d)$

$$36 = 6 + 6d$$
$$30 = 6d$$
$$5 = d$$

then, find a_1 using, again: $a_n = a_1 + (n-1)d$

$$a_{11} = a_1 + (11-1)(5)$$
$$36 = a_1 + 10(5)$$
$$36 = a_1 + 50$$
$$-14 = a_1$$

First 4 terms:
$-14, -9, -4, 1$ (add 5 each time)

b) $a_{10} = a_1 + (10-1)(d)$

$a_{10} = -14 + 9(5) = -14 + 45 = 31$

c) $a_{25} = -14 + (25-1)(5) = -14 + 24(5) = -14 + 120 = 106$

d) Use arithmetic Sum $S_n = \frac{n}{2}(a_1 + a_n)$

$S_{25} = \frac{25}{2}(-14 + 106) = \frac{25}{2}(92) = 1150$

23) $A(t) = P(1+\frac{r}{n})^{nt}$ depreciation: $r<0$, $n=1$

$A(10) = 260000(1-.11)^{10} = 260000(.89)^{10}$

$A(10) \approx 81072.5$

round to nearest $100: worth about $81,100 after 10 years.

24) $3^{-2} \cdot 9^{x} = 27^{2}$ Notice all bases are powers of 3. Rewrite all with same power.

$3^{-2} \cdot (3^2)^x = (3^3)^2$

$3^{-2} \cdot 3^{2x} = 3^{6}$ Use properties of exponents

$3^{-2+2x} = 3^{6}$

$-2+2x = 6$

$2x = 8$

$x = 4$

check:

$3^{-2} \cdot 9^{4} = 27^{2}$

$\frac{1}{9} \cdot 6561 = 729$

$729 = 729$ ✓

25) An infinite geometric sum exists if $|r|<1$

$\frac{1}{4} < 1$ so, yes, a sum exists.

Use formula: $S = \frac{a_1}{1-r}$ (formula is for infinite sum only!)

Find the first term (when $n=0$):

$-4(\frac{1}{4})^0 = -4$

$S = \frac{-4}{1-\frac{1}{4}} = \frac{-4}{\frac{3}{4}} = \frac{-16}{3}$

26) $y = 2 + \log(x-1)$ switch x & y; then solve for y.

$x = 2 + \log(y-1)$

$x-2 = \log(y-1)$ Recall $\log = \log_{10}$

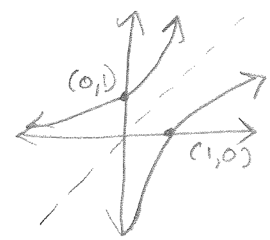
$10^{x-2} = y-1$

$y = 10^{x-2} + 1$

27) $y = 3^x$ Switch x & y & solve for y.

$x = 3^y$ Rewrite as log.

$\log_3 x = y$ Reflect in line $y = x$



28) $\dfrac{\cancel{6}^{3}\, e^{-5x}}{\cancel{2}_{1}\, e^{2x}}$ e is just another base. Same exponent rules apply.

$\dfrac{3}{e^{2x} e^{5x}}$ add exponents when multiplying powers of same base.

$\dfrac{3}{e^{7x}}$

29) $z = kxy$ (joint variation is a product)

$x = -5,\ y = 2,\ z = \frac{3}{4}$:

$\frac{3}{4} = k(-5)(2) = -10k \Rightarrow k = \frac{3}{-40}$

Equation: $z = \dfrac{3xy}{-40}$

30)
$$
\begin{array}{r}
2x^2 + 3 \\
3x^2+x-2 \overline{)\ 6x^4 + 2x^3 + 5x^2 + 3x} \\
-\ 6x^4 + 2x^3 + 4x^2 \\
\hline
9x^2 + 3x \\
-\ 9x^2 + 3x + 6 \\
\hline
6
\end{array}
$$
6 → remainder

$(6x^4 + 2x^3 + 5x^2 + 3x) \div (3x^2 + x - 2) = 2x^2 + 3 + \frac{6}{3x^2 + x - 2}$

31) $3.2 \ln 8 = 3.2(\ln 8) \approx 3.2(2.07944) = 6.65421$

32) $\ln 32x^5 y = \ln 32 + \ln x^5 + \ln y = \ln 32 + 5\ln x + \ln y$

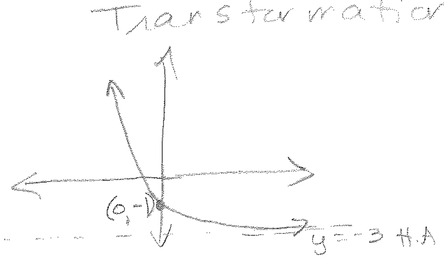
33) $f(x) = 2e^{-x} - 3$ PF: $f(x) = e^x$

Transformations: $-x \Rightarrow$ exponential decay

$-3 \Rightarrow$ shift down 3

$2 \Rightarrow$ steeper

y-int: $f(0) = 2e^{0} - 3 = 2(1) - 3 = -1$



34) $\sqrt[3]{x+12} = 5$ D: all real numbers

$\left(\sqrt[3]{x+12}\right)^3 = 5^3$

$x + 12 = 125$

$x = 113$ check: $\sqrt[3]{113+12} = 5$

$\sqrt[3]{125} = 5$

$5 = 5$ ✓

35) $2x^{\frac{3}{4}} = 54$ Isolate the variable expression

$x^{3/4} = 27$ Raise to the reciprocal power

$\left(x^{3/4}\right)^{4/3} = (27)^{4/3}$

$x = 27^{\frac{4}{3}} = 3^4 = 81$

36) Discriminant = $b^2 - 4ac$ when >0, 2 real roots
when $=0$, 1 real root
when <0, 2 complex roots (No real roots)

$2x^2 - x + 8$

$b^2 - 4ac = (-1)^2 - 4(2)(8) = 1 - 64 = -63 \Rightarrow$ 2 complex roots

No real roots; will not have x-intercepts.

37) $A(t) = 2250\left(1 + \frac{.06}{4}\right)^{4t}$

$A(10) = 2250(1.015)^{4(10)} = 4081.54$

After 10 years, you would have \$4081.54

38) $f(x) = x^3 + x^2 - 9x - 9$. If $f(-1) = 0$, then use synth. division to get the depressed (remaining) polynomial

$$\begin{array}{r|rrrr} -1 & 1 & 1 & -9 & -9 \\ & & -1 & 0 & 9 \\ \hline & 1 & 0 & -9 & 0 \end{array}$$

$x^2 - 9 \Rightarrow (x+3)(x-3)$

39) $3i(1-2i)$ Distribute

$3i(1) - 3i(2i)$

$3i - 6i^2$

$3i - 6(-1)$

$6 + 3i$ (in standard form)