MA 110 - 10/17.

Exam Covers HW 11-22. Material from Friday will be examined on exam 3.

REEF #1.

$f(x) = x + 1.$

$g(x) = x^2$

$g(f(x)) = (x+1)^2$

$g(f(2)) = (3)^2 = 9$

$f(g(x)) = g(x) + 1$

$= x^2 + 1.$

$f(g(2)) = 2^2 + 1 = 5.$

~~Spring~~ 16 Exam 2

Fall 15

Is -7 a zero of

$f(x) = x^3 + 4x^2 - 49x - 196$

- If it is a zero, find others.

- Divide by $x+7$

$$
\begin{array}{r|l}
 & x^2 - 3x - 28 \\
\hline
x+7 & x^3 + 4x^2 - 49x - 196 \\
 & x^3 + 7x^2 \\
\hline
 & 0 - 3x^2 - 49x \\
 & -3x^2 - 21x \\
\hline
 & 0 - 28x - 196 \\
 & -28x - 196 \\
\hline
 & 0
\end{array}
$$

Remainder zero ~~of~~ is equivalent to

$f(-7) = 0$

- ~~Yes~~ -7 is a zero

$f(x) = (x+7)(x^2 - 3x - 28) + 0$

$= (x+7)(x-7)(x+4)$.

Zeros are

$-7, 7, -4$

- Remainder theorem
- Factor theorem

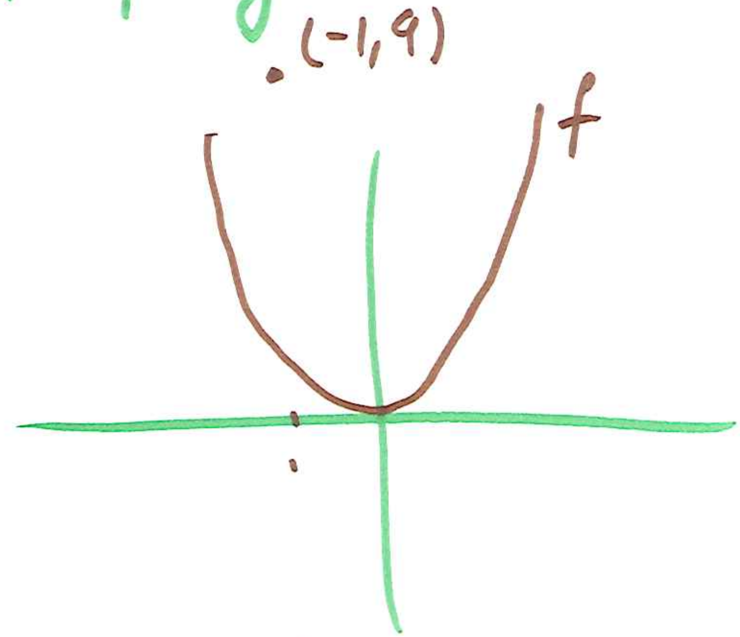
REEF #2

If $f(x) = x^2$ and the graph of f is shifted up 9 units & to the left one unit. Find the graph of the new function.

$$g(x) = (x+1)^2 + 9$$

Check. $(0,0)$ on graph of f.

Then $(-1, 9)$ is on graph of g.



To check if $(-1,9)$ is on graph of g, we need to check

$$g(-1) \stackrel{?}{=} 9 \ ?$$

$$g(-1) = 0^2 + 9 = 9 \checkmark$$

Find all horiz. & vert. asymptotes for

$$f(x) = \frac{-4x^2+18x+16}{x^2+8x+7} = \frac{-2(2x^2+9x+8)}{(x+1)(x+7)}.$$

Horiz: ~~Vertical~~ asymptote.

Num. & den. have the same degree - asympt. is

$$y = \frac{-4x^2}{x^2} = \underline{-4}$$

Graph has no holes.

Vertical asymptotes

Possible v. asympt. are $x=-1$ or $x=-7$.

Check at $x=-1$.

Num. is $-2(2(-1)^2+{}^{-}9+8)$
$= -2 \neq 0$

$x=-1$ is v. asympt.

$x=-7$ Num is

$-2(2\cdot(-7)^2-63+8) \neq 0$

$x=-7$ is v. asympt.

REEF #3.

Solve

$$\frac{x^2(x-11)(x+1)}{(x-4)(x+9)} \geq 0$$

$$f(x) = \frac{x^2(x-11)(x+1)}{(x-4)(x+9)}\cancel{\geq 0}.$$

may change signs at

$x = -9, -1, 0, 4, 11.$

Signchart

x		-9		-1		0		4		11	
$f(x)$	$+$		$-$		$+$		$+$		$-$		$+$

$f(x)$ ~~≥ 0~~ is undefined at $x=4$ and -9.

$f(x) \geq 0$ at

$(-\infty, -9) \cup [-1, 0] \cup [0, 4]$

$\cup [11, \infty)$

$= (-\infty, -9) \cup [-1, 4] \cup [11, \infty).$

Write in the form $a+bi$

$$\frac{2+3i}{1+i}$$

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

$$= \frac{2-3i^2+3i-2i}{1-i^2}$$

$$= \underline{\frac{5}{2} + \frac{i}{2}}.$$

Let $f(x) = \dfrac{x-7}{x-8}$

Find f^{-1}!

Solve $y = \dfrac{x-7}{x-8}$

$$y(x-8) = x-7$$

$$yx - 8y = x - 7$$

$$\underline{-x \quad +8y} \qquad \underline{-x+8y}$$

$$yx - x = 8y - 7$$

$$x(y-1) = 8y-7$$

$$x = \frac{8y-7}{y-1}.$$

$$f^{-1}(x) = \frac{8x-7}{x-1}.$$

give the domain &

range of f^{-1}.

Domain is $(-\infty, +1) \cup (1, \infty)$

Range of f^{-1} is domain of

f is $(-\infty, 8) \cup (8, \infty)$