Name: Key **Hour:** 11 am, 1 pm **Exam 5**

Directions: (1) Answer each problem completely, show your algebra (you need not show your arithmetic), and box your final answer. (2) No notes, no textbooks, no communication devices, no discussion. (3) You may use an ACT-approved calculator.

100 points. 50 minutes. Math 107-12/18, Fall 2014 (Dr. Daniel Brice)

1. [6 points] Divide using synthetic division $(3x^3 + 8x^2 - x + 5) / (x - 1)$.

(a) $3x^2 + 11x + 10$ r 15 (b) $3x^2 + 11x + 10$ r 5 (c) $3x^2 - 11x - 10$ r 15
(d) $3x^2 - 11x - 10$ r 5 (e) None of these

2. [6 points] List the possible rational zeros of $f(x) = 5x^3 - 7x^2 + 2$.

(a) $\pm 1, \pm 2, \pm 5$ (b) $\pm 2, \pm 5, \pm 7$ (c) $\pm 1/2, \pm 1, \pm 5/2, \pm 5$ (d) $\pm 1/5, \pm 2/5, \pm 1, \pm 2$ (e) None of these

3. [6 points] Find all rational zeros of $f(x) = x^3 - 11x^2 + 23x + 35$.

(a) $\{-1, 5, 7\}$ (b) $\{-5, -1, 7\}$ (c) $\{-1, 1, 7\}$ (d) $\{-7, -1, 7\}$ (e) None of these

4. [6 points] Find the horizontal asymptote, if any, of $f(x) = \dfrac{3x^4 - 5}{x^2(6x^2 - 1)}$.

(a) $y = 1/2$ (b) $y = 1$ (c) $y = 3/2$ (d) $y = 3$ (e) None of these

5. [6 points] P varies inversely with x. When $x = 3$, $P = 4$. Write the the formula for P in terms of x.

(a) $P = \dfrac{9}{x}$ (b) $P = \dfrac{12}{x}$ (c) $P = \dfrac{5x}{3}$ (d) $P = \dfrac{4x}{3}$ (e) None of these

6. [6 points] z varies jointly with x and u and inversely with the square of v. Write the formula for z, using k as the constant of variation.

(a) $z = k\dfrac{xu}{v^2}$ (b) $z = k\dfrac{x}{uv^2}$ (c) $z = k\dfrac{u}{xv^2}$ (d) $z = k\left(\dfrac{xu}{v}\right)^2$ (e) None of these

7. [6 points] Which expression is the same as $\ln\left(\dfrac{x^3 z}{y^5}\right)$?

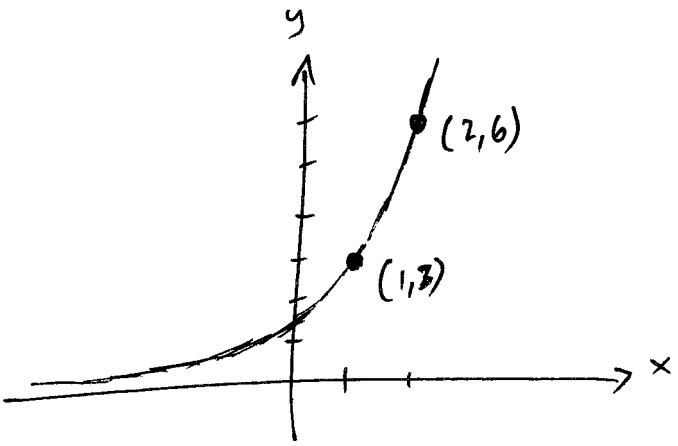
(a) $\dfrac{3\ln(xy)}{5\ln(y)}$ (b) $\dfrac{3\ln(x)\ln(z)}{5\ln(y)}$ (c) $(\ln x)^3 + \ln z - (\ln y)^5$ (d) $3\ln x + \ln z - 5\ln y$ (e) None of these

8. [6 points] Solve $7 + \log_2(2x - 1) = 5$ for x.

(a) $x = 1/4$ (b) $x = 3/8$ (c) $x = 1/2$ (d) $x = 5/8$ (e) None of these

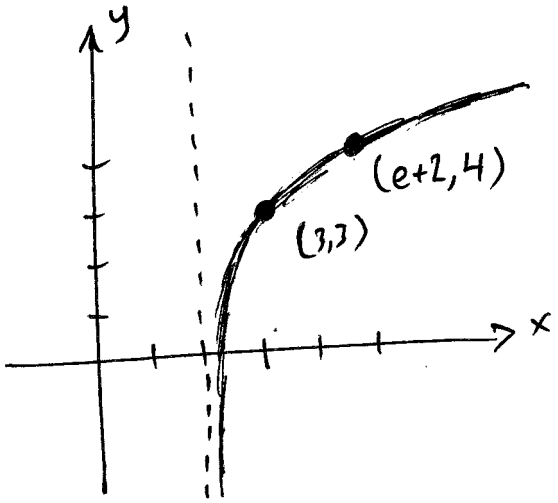
9. [12 points] Graph $f(x) = 3(2)^{x-1}$. State the domain and range.

	$y = 2^x$	add 1 to x	mult y by 3
point	(0,1)	(1,1)	(1,3)
point	(1,2)	(2,2)	(2,6)
asymptote	$y=0$	$y=0$	$y=0$



10. [12 points] Graph $f(x) = \ln(x-2) + 3$. State the domain and range.

	$y = \ln(x)$	add 2 to x	add 3 to y
point	(1,0)	(3,0)	(3,3)
point	(e,1)	(e+2,1)	(e+2,4)
asymptote	$x=0$	$x=2$	$x=2$

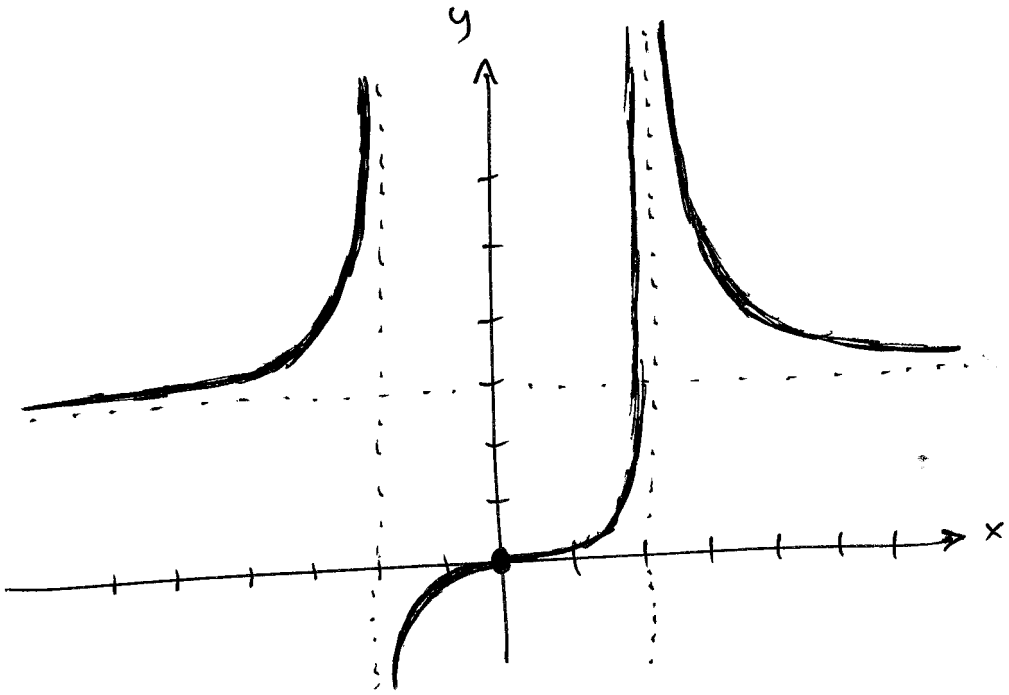


11. [12 points] Graph $f(x) = \dfrac{3x^3}{(x+2)(x-2)^2}$. Include horizontal asymptotes, vertical asymptotes and x-intercepts.

horiz asymp: $y = 3$

vert asymp: $x = -2$, $x = 2$
mult 1 mult 2

x-int: $x = 0$
mult 3



12. [12 points] $f(x) = x^4 + 3x^3 - 3x^2 - 11x - 6$. Use synthetic division to fully factor $f(x)$, then graph $f(x)$.

possible roots: $\pm 1, \pm 2, \pm 3, \pm 6$

1	1	3	-3	-11	-6
		1	4	-1	-12
	1	4	-1	-12	-18

-1	1	3	-3	-11	-6
		-1	-2	5	6
	1	2	-5	-6	0

$f(x) = (x^3 + 2x^2 - 5x - 6)(x+1)$

2	1	2	-5	-6
		2	8	6
	1	4	+3	0

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

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

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

end behavior:

even degree
+ leading term

roots: $x=-1$, $x=-3$, $x=2$
mult 2 mult 1 mult 1