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MATH 126 FINAL EXAM SAMPLE

NOTE: The final exam will only have 14 questions. The different parts of each question (part A, B, etc.) are variations. Know how to do all the variations on this exam.

1A.) (5 pts) Find the intercepts and indicate what kind of symmetry this graph has: $y^2 = x + 4$.

x-int: _____

y-int: _____

Symmetry: _____

1B.) (5 pts) Find the intercepts and indicate what kind of symmetry this graph has: $x^3 + y^3 = 9x$.

x-int: _____

y-int: _____

Symmetry: _____

2A.) (3 pts) Find the domain: $y = \frac{2x - 7}{x^3 + 16x}$. Write in interval notation.

2A. _____

2B.) (3 pts) Find the domain: $y = \frac{8x - 3}{\sqrt{11 - 5x}}$. Write in interval notation.

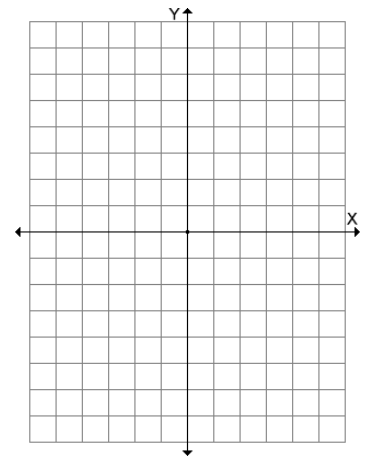
2B. _____

2C.) (3 pts) Find the domain: $y = \frac{\sqrt{3x - 4}}{45}$. Write in interval notation.

2C. _____

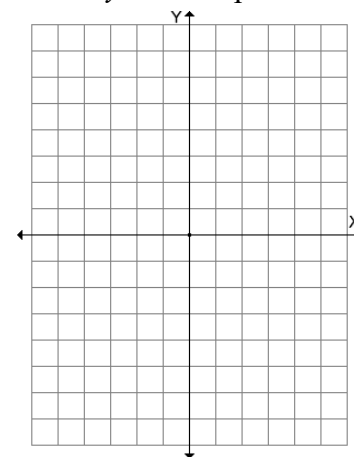
3A.) (4 pts) Find the equation of a line (in slope-intercept form) that passes through $\left(\frac{3}{2}, -4\right)$ and $(-3, -7)$.

Graph your equation.



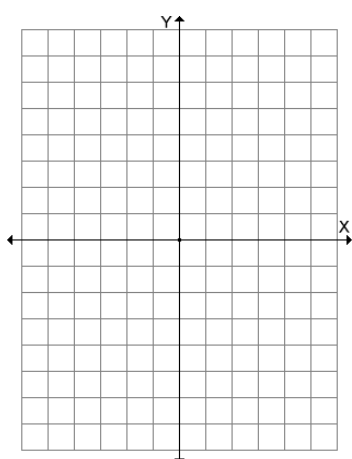
Equation: _____

3B.) (4 pts) Find the equation of a line (in slope-intercept form) that is perpendicular to $2x - 3y = 4$ and passes through $(-2, 5)$. Graph your equation.

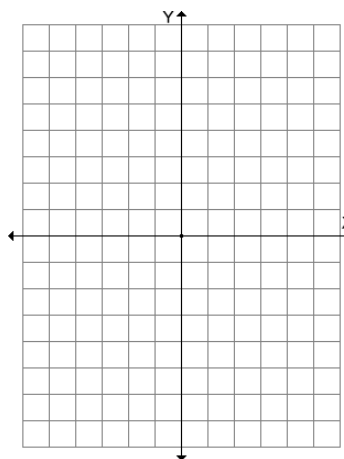
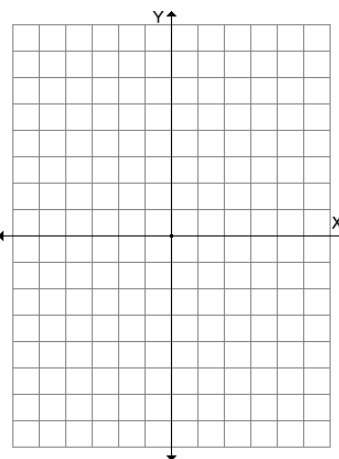
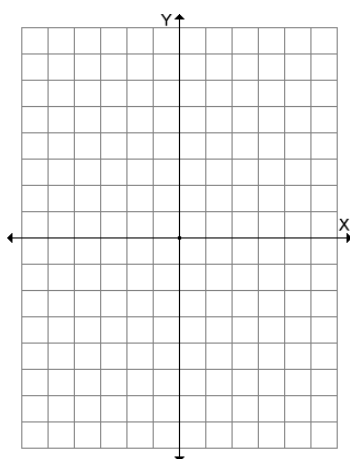


Equation: _____

4A.) (5 pts) Graph using transformations: $y = -(x - 2)^3 - 1$. Start with the base graph (library function) and then graph each successive transformation. The final graph will be your graph of $y = -(x - 2)^3 - 1$.

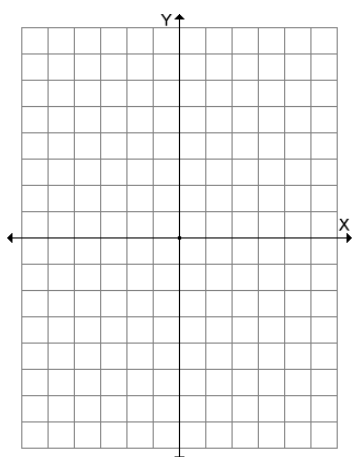


Base Graph

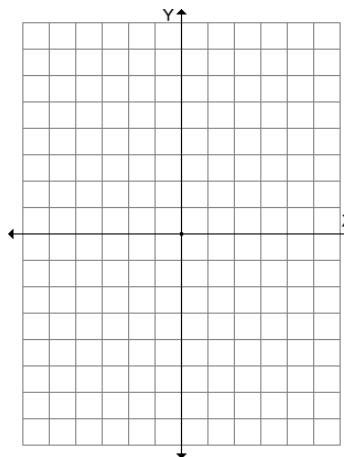
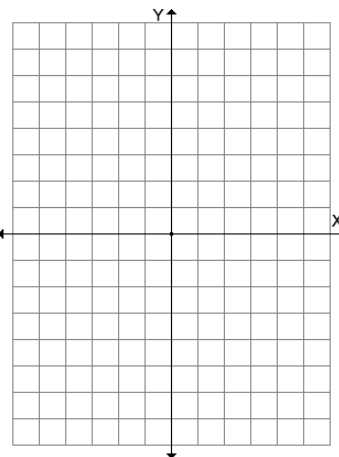
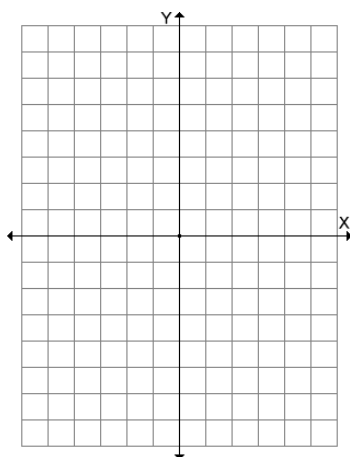


Final Graph

4B.) (5 pts) Graph using transformations: $y = \sqrt{-(x - 4)} - 1$. Start with the base graph (library function) and then graph each successive transformation. The final graph will be your graph of $y = \sqrt{-(x - 4)} - 1$.



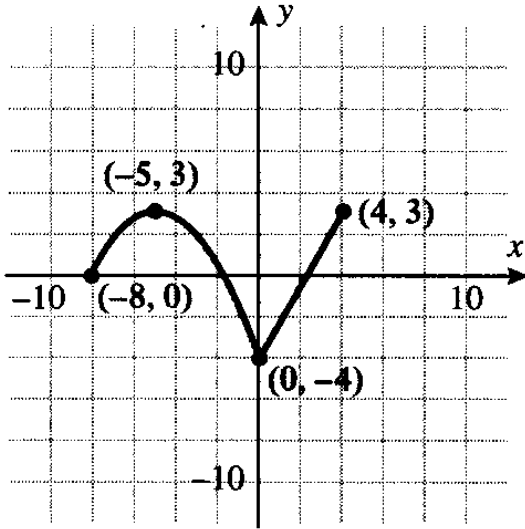
Base Graph



Final Graph

NOTE: For question 5 not all these parts will be given, but you need to know how to do all of them since any of them could be on the exam.

5.) (6 pts) Use the graph of $f(x)$ below to find the following.



a.) domain: _____

b.) range: _____

c.) number(s) for which f has a local max.

d.) number(s) for which f has a local min.

e.) local minimum: _____

f.) local maximum: _____

g.) Find $f(-8)$: _____

h.) When does $f(x) = 3$? _____

i.) Interval(s) at which f is increasing

j.) Interval(s) at which f is decreasing

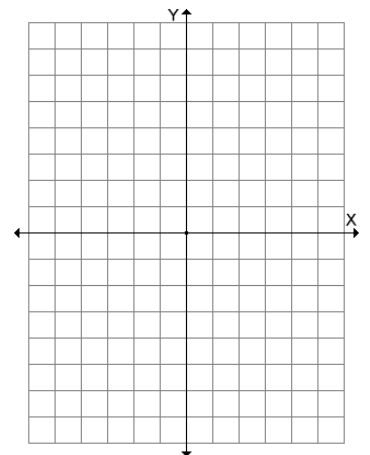
6A.) (5 pts) Given $f(x) = \begin{cases} x^2 & \text{if } x \leq 0 \\ -\sqrt{x} & \text{if } x > 0 \end{cases}$ find the following and graph.

i.) $f(0)$: _____

ii.) $f(9)$: _____

iii.) $f\left(\frac{9}{4}\right)$: _____

iv.) $f(-4)$: _____



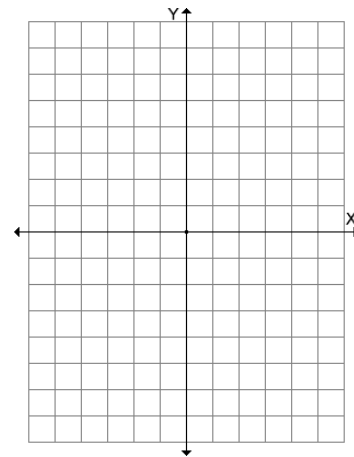
6B.) (5 pts) Given $f(x) = \begin{cases} |x| & \text{if } x < 3 \\ -x+3 & \text{if } x \geq 3 \end{cases}$ find the following and graph.

i.) $f(0)$: _____

ii.) $f(3)$: _____

iii.) $f(-3)$: _____

iv.) $f\left(\frac{7}{2}\right)$: _____



7A.) (4 pts) Given $f(x) = 2x + 1$ and $g(x) = \frac{1}{x^2 - 4}$ find :

i.) $(f \circ g)(x)$ Write as a single fraction.

i. _____

ii.) $(g \circ f)(x)$ Factor if possible.

ii. _____

7B.) (4 pts) Given $f(x) = \frac{1}{\sqrt{x}}$ and $g(x) = x^2 - 6x + 9$, find :

i.) $(f \circ g)(x)$ (Fully factor and simplify your answer.)

i. _____

ii.) $(g \circ f)(1)$

ii. _____

8A.) (4 pts) Let $f(x) = 3 - 2x^2$. Find the difference quotient.

Use $\frac{f(x+h) - f(x)}{h}$.

8A. _____

8B.) (4 pts) Let $f(x) = 3x^2 - \frac{x}{5}$. Find the difference quotient.

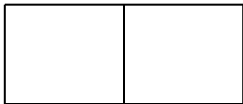
8B. _____

Use $\frac{f(x+h) - f(x)}{h}$.

9A.) (4 pts) A rancher has 6000 linear feet of fencing and wants to enclose a rectangular field and then divide it into two equal pastures as shown below. What dimensions produce the maximum enclosed area? What is the maximum area?

Dimensions: _____

Max. Area: _____



9B.) (4 pts) Given $C(x) = 680 + 4x - 0.01x^2$ and $R(x) = 12x - 0.02x^2$, where x represents the number of units produced.

i.) Find the amount of units that must be sold to maximize the profit.
(Profit = Revenue - Cost)

i. _____

ii.) What is the maximum profit?

ii. _____

9C.) (4 pts) A model rocket is launched. The height, in feet, of the rocket $h(t)$ at t seconds after launch is determined by the equation $h(t) = -\frac{1}{2}t^2 + 15t$.

i.) Find the number of seconds after launch it takes for the rocket to reach its maximum height. i. _____

ii.) Find the maximum height obtained by the rocket. ii. _____

10A.) (4 pts) The function $f(x) = 6x^3 - 5x^2 - 29x + 10$ has a zero at $x = -2$. Use synthetic division and factoring to find the other zeros. 10A. _____

10B.) (4 pts) The function $f(x) = 27x^3 - 54x^2 + 27x - 4$ has a zero at $x = \frac{4}{3}$. Use synthetic division and factoring to find the other zeros. 10B. _____

11A.) (4 pts) Solve and write in interval notation:
 $(2x - 1)(3x - 7)(x - 4) < 0$

11A. _____

11B.) (4 pts) Solve and write in interval notation:
 $\frac{(1-x)(x-3)^2}{x+2} \geq 0$

11B. _____

12A.) (4 pts) Fully expand and simplify: 12A. _____

$$\log_3 \left[\frac{x^3(x-2)^2}{3\sqrt{x^2+5}} \right]$$

12B.) (4 pts) Fully expand and simplify: 12B. _____

$$\ln \left(\frac{e\sqrt{y-3}}{x \cdot z^5} \right)$$

13A.) (4 pts) Solve for x: $\log_3(x - 5) - \log_3(2x + 3) = 0$

13A. _____

13B.) (4 pts) Solve for x: $\log_2(x^2 - 7x) = 3 + \log_2(x + 2)$

13B. _____

14A.) (4 pts) A colony of bacteria grows according to the law of uninhibited growth according to the function $N(t) = 100e^{0.045t}$ where N is the number of bacteria and t is in days. How long will it take the population to reach 140 bacteria?

14A. _____

14B.) (4 pts) The following decay function estimates amount of grams of Bismuth-210 after t days: $A(t) = 100e^{-0.1382t}$. How long will it take for the original amount of Bismuth-210 to decay to 38 grams? (Round to the nearest day.)

14B. _____