

MA1161
Test 1
Spring 2007

Name: _____

Non-calculator section: You may not use your calculator on this section. You must show enough work to justify all answers. Once you have handed in this section you may not have it back.

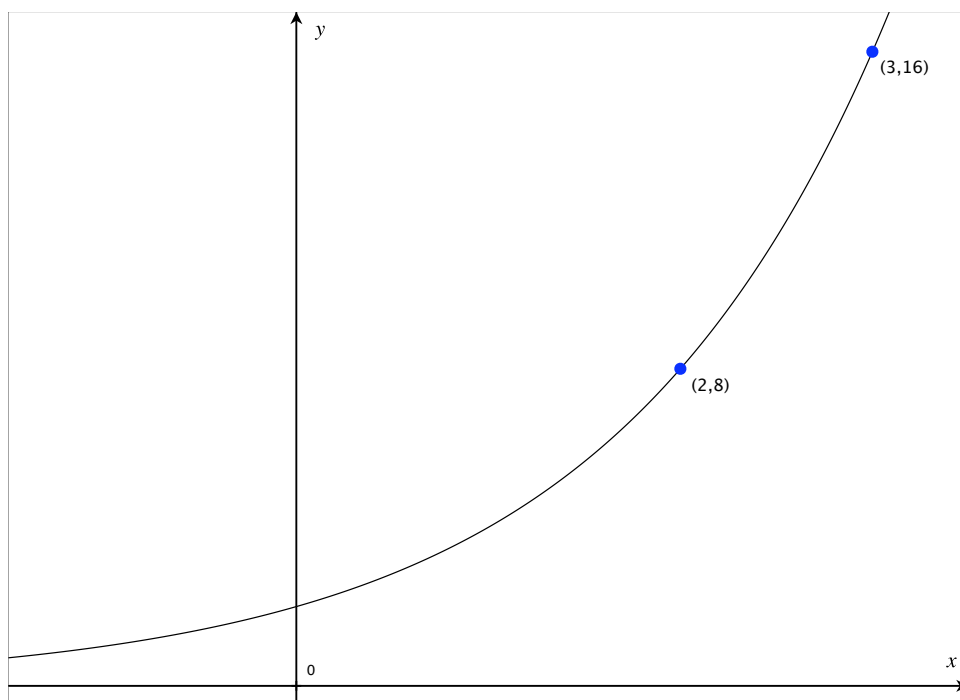
Page	Score	
1		/ 12
2		/ 11
3		/ 4
4		/ 19
5		/ 17
Non-calculator total		/ 63
Calculator total		/ 37
Final score		/ 100

1. Find the domain and range of $y = -\frac{1}{x^2+3}$.

Domain: All reals [3]

Range: $-\frac{1}{3} \leq y < 0$ [3]

2. Give a possible formula for the function in the following figure.



$$y = 2 \cdot 2^x \quad [6]$$

3. Which of the following functions represent exponential growth and which represent exponential decay.

$$P = 6(1.06)^t$$

$$Q = 4.2e^{0.04t}$$

$$S = 2e^{-0.2t}$$

$$R = 8(0.88)^t$$

Growth: P, Q [2]

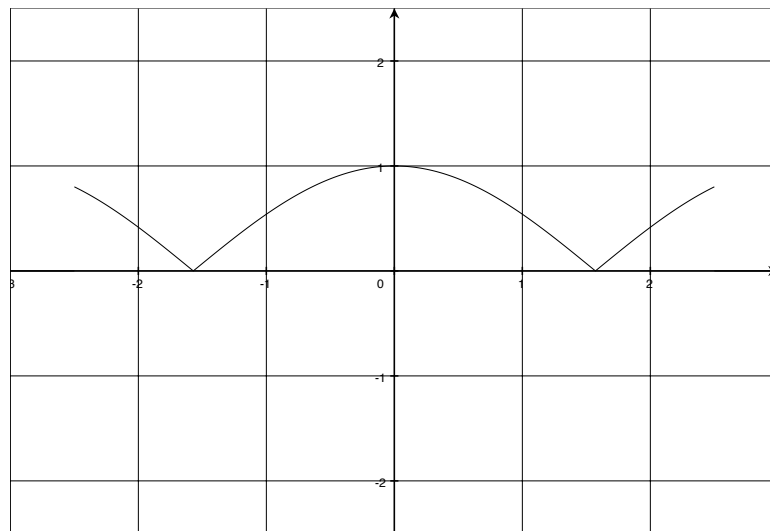
Decay: S, R [2]

4. Let $f(x) = ab^x$, $b > 0$. Find and simplify $\frac{f(x+h)}{f(x)}$.

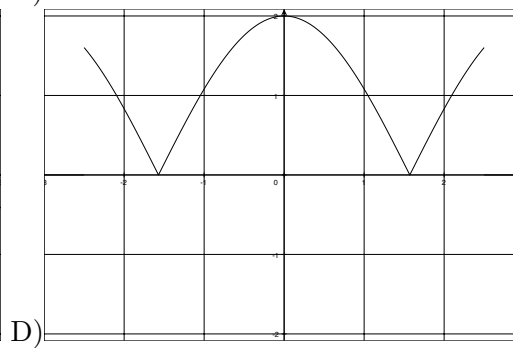
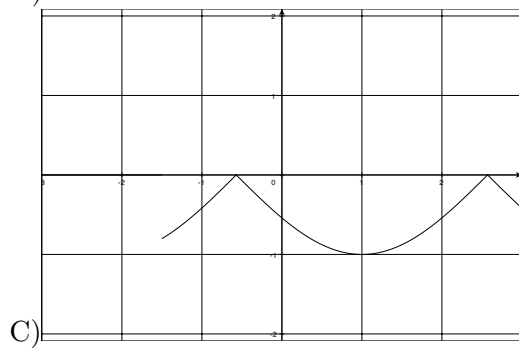
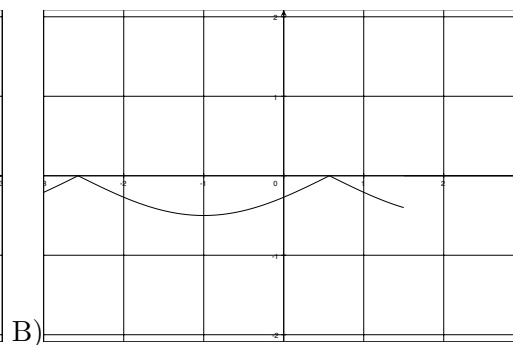
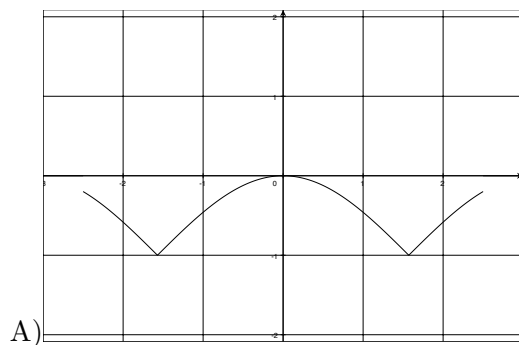
$$b^h \quad [4]$$

5. Decide if the function $g(t) = t^2 - 2$ is invertible. If so, find the inverse. If not, explain why. [3]
Not invertible. It is a parabola, so it fails the horizontal line test.

6. The following graph is a graph of $y = f(x)$.



Consider the following transformations of $f(x)$.



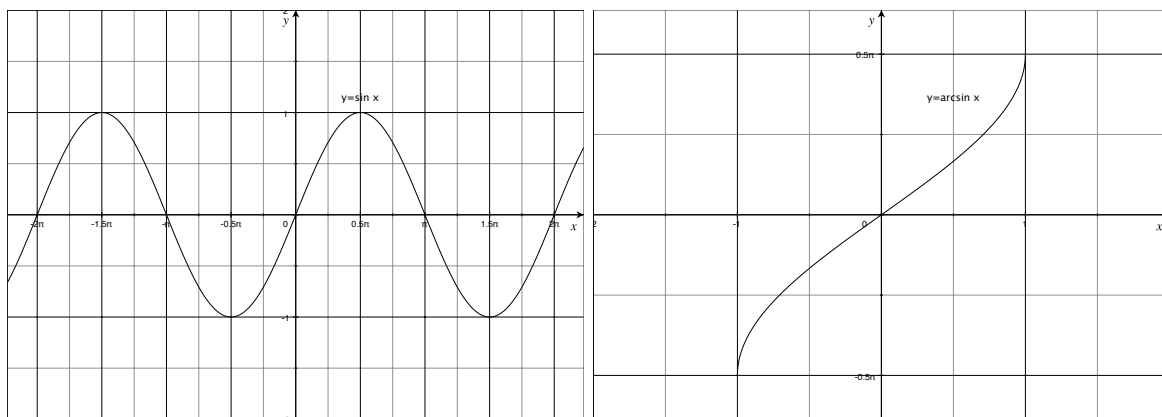
Which could be the graph of $-\frac{1}{2}f(x+1)$? B [2]

Which could be the graph of $f(x) - 1$? A [2]

7. Let $g(x) = 2x^2 - 2x$ and $h(x) = 3x - 1$. Find and simplify $h(g(x))$.

$$h(g(x)) = 6x^2 - 6x - 1 \quad [3]$$

8. (a) Sketch the graphs of both $y = \sin x$ and $y = \arcsin x$. Be sure to scale the axes and label which graph is of which function. [8]



- (b) What is the domain of the function $f(x) = \arcsin x$?

$$-1 \leq x \leq 1 \quad [2]$$

- (c) What is the range of the function $f(x) = \arcsin x$?

$$-\frac{\pi}{2} \leq f(x) \leq \frac{\pi}{2} \quad [2]$$

9. Solve for x and give an exact solution.

$$2 \cdot 3^x = 3 \cdot e^{4x}$$

$$x = \frac{\ln 3 - \ln 2}{\ln 3 - 4} \quad [4]$$

10. Given that $\ln 2 = 0.69$ and $\ln 5 = 1.61$ to two decimal places, find

(a) $\ln\left(\frac{1}{10}\right)$

-2.3 [4]

(b) $\ln 100$

4.6 [4]

11. Let $f(x) = \frac{(x+3)(2x-5)}{x^2-5x-6}$.

(a) Find the zeros of $f(x)$.

$(-3, 0)$ and $(\frac{5}{2}, 0)$ [3]

(b) Find the horizontal asymptote of $f(x)$ or state that it has none.

$y = 2$ [3]

(c) Find all vertical asymptotes of $f(x)$.

$x = 6$ and $x = -1$ [3]

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Calculator total		/ 37

1. Consider the function $y = 2 \sin x$. Give an equation of a line that intersects the graph of this function ...

(a) ...once.

$$x = 0 \quad [2]$$

(b) ...never.

$$y = 6 \quad [2]$$

(c) ...an infinite number of times.

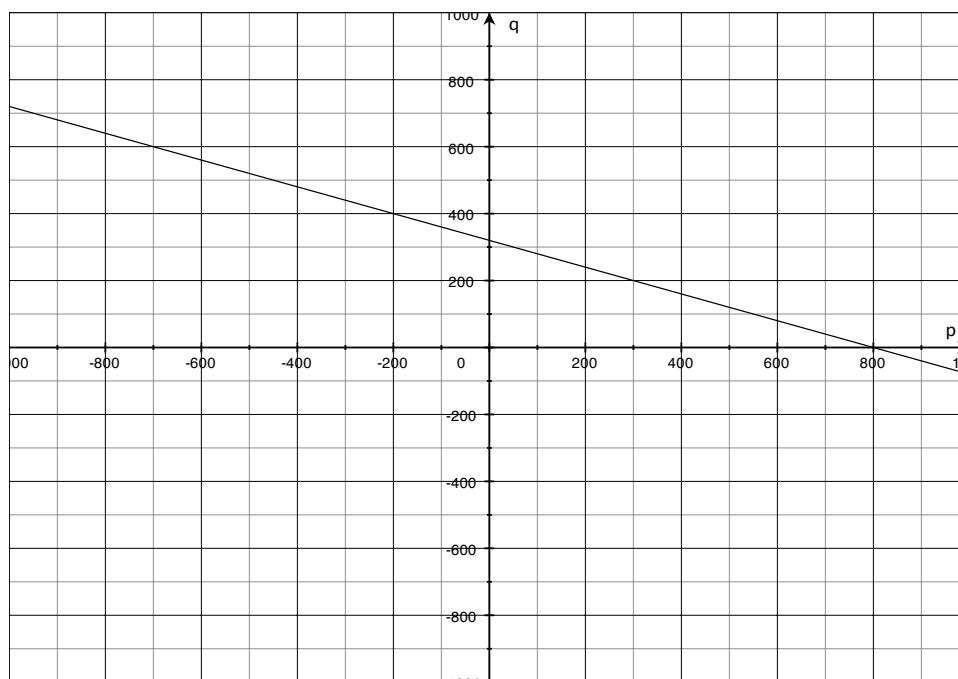
$$y = 0 \quad [2]$$

2. The demand function for a certain product, $q = D(p)$ is linear, where p is the price per item in dollars and q is the quantity demanded. If p increases by \$5, market research shows that q drops by two items. In addition, 100 items are purchased if the price is \$550.

(a) Find a formula for q as a linear function of p .

$$q = -\frac{2}{5}p + 320 \quad [4]$$

(b) Draw a graph with p on the horizontal axis. Be sure to scale your axes. [4]



3. Convert $P = 2(16)^t$ to the form $P = P_0 e^{kt}$. Give an exact answer.

$$P = 2e^{(\ln 16)t} \quad [3]$$

4. Complete the table to show the values for f , g , and h given that $f(x)$ is even, $g(x)$ is odd, and $h(x) = g(x)^2 - f(x)$. [4]

x	$f(x)$	$g(x)$	$h(x)$
-2	2	8	62
-1	-1	1	2
0	-2	0	2
1	-1	-1	2
2	2	-8	62

5. Suppose the voltage, V , in an electric outlet is given by

$$V = 339 \sin(100\pi t),$$

where V is measured in volts and time, t , is measured in seconds.

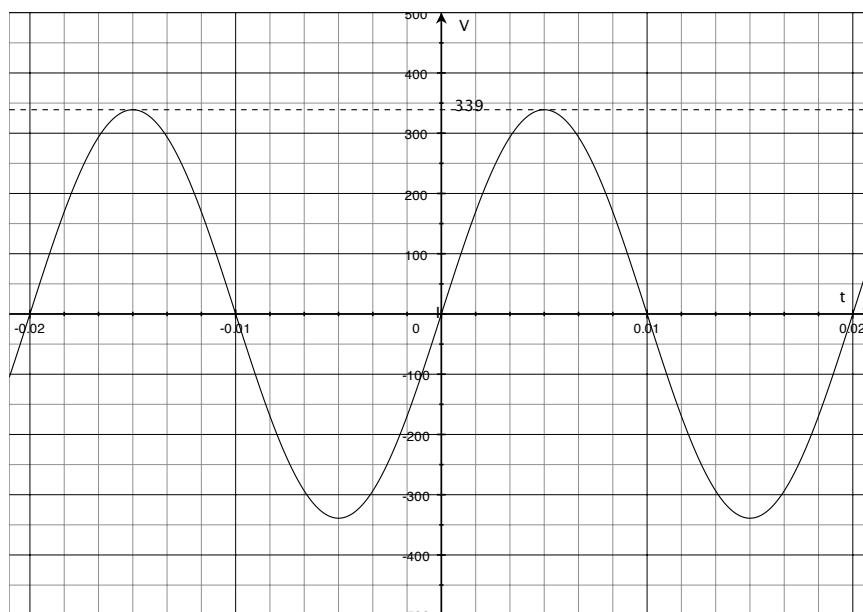
- (a) What is the amplitude of this oscillation?

$$339 \text{ volts} \quad [2]$$

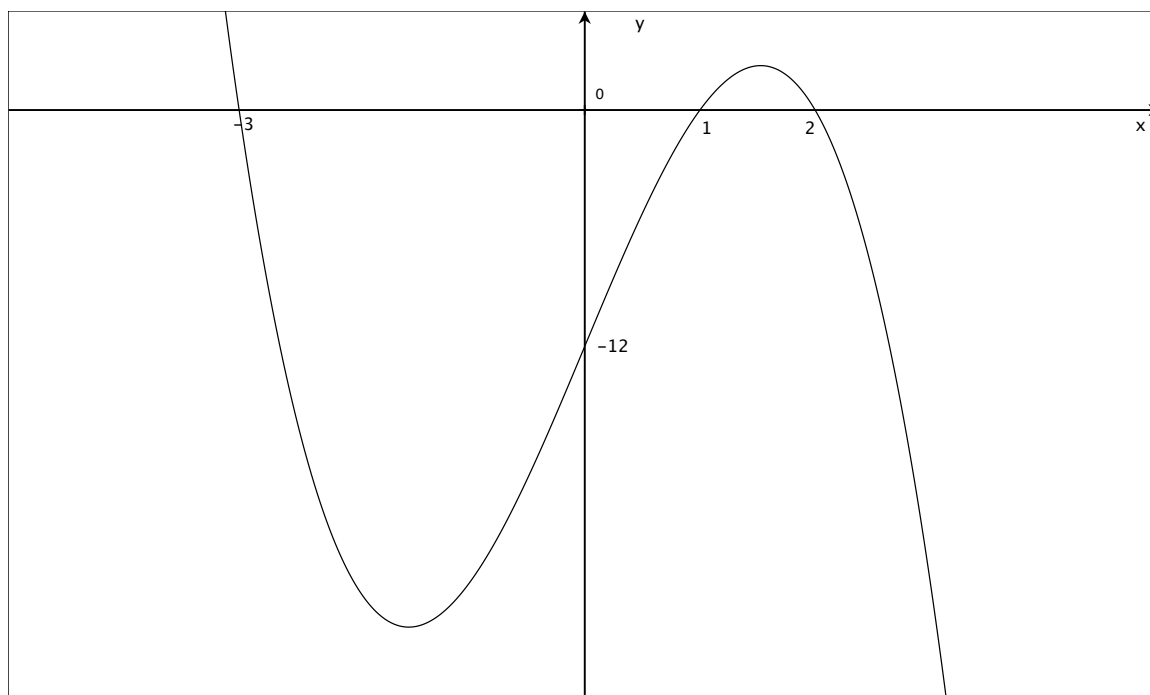
- (b) What is the period?

$$\frac{1}{50} \text{ second} \quad [2]$$

- (c) Sketch a graph of at least two periods of $V(t)$, labeling the amplitude and at least two t -intercepts. [6]



6. Find a possible formula for the polynomial $f(x)$ whose graph is given below.



$$f(x) = -2(x + 3)(x - 1)(x - 2) \quad [6]$$