

Simon Fraser University
Math 100

Midterm 2- Exam 1

Date: March 5, 2008

Time: 11:30 - 12:20

Last Name (print): Solutions First Name _____

Signature: _____ SFU Email ID: _____

Instructions:

1. Do not open this exam until instructed to do so.
2. **No calculators, notes or books are allowed.**
3. When presenting a final answer for your solution, calculator-ready expressions will be given full credit.
4. Show all your work. **No credit** will be given for an answer without the correct explanation and accompanying work.
5. Answer the questions in the space provided. Continue on the back of the previous page if necessary.

Question	Mark	Maximum
1		5
2		4
3		7
4		12
5		8
6		8
Total		44

1. Decide if the following statements are true or false. In each case mark (circle or cross) the correct answer. Show all work and/or give a reason for your decision. **NO credit** will be given for an answer without explanation or supporting work.

[1 pts]

- (a) According to the rational zeroes theorem the number $x = -1/2$ is a **candidate** for a zero of the polynomial $x^3 - 6x^2 + 5x - 6$.

[TRUE]

[FALSE]

Thm: states zeroes

are $\frac{p}{s}$ $p \rightarrow \pm 1, \pm 2, \pm 3, \pm 6$ $s \rightarrow \pm 1$

[1 pts]

- (b) The graph of a rational function can have more than one horizontal asymptote.

[TRUE]

[FALSE]

 $f(x) = \frac{P(x)}{Q(x)}$ hashor. asympt. if : a) $\deg P = \deg Q$ b) $\deg P < \deg Q$

$$y = \frac{a_n}{b_n}$$

$$y = 0$$

[1 pts]

- (c) According to the intermediate value theorem if $f(x) = x^3 - 6x^2 + 2$ then there is a value $0 < c < 1$ for which $f(c) = 0$.

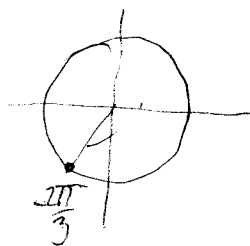
[TRUE]

[FALSE]

$$f(0) = 2 > 0$$

$$f(1) = 1 - 6 + 2 < 0$$

- [1 pts] (d) The angle of reference of $t = -\frac{2\pi}{3}$ is $\frac{\pi}{3}$.



$$-\frac{2\pi}{3} + \pi = \frac{\pi}{3}$$

[TRUE] [FALSE]

- [1 pts] (e) The length of the arc of a circle of radius 5, subtended by an angle $\theta = \frac{5\pi}{3}$ is: $\frac{25\pi}{3}$.

$$S = r\theta = 5\left(\frac{5\pi}{3}\right) = \frac{25\pi}{3}$$

[TRUE] [FALSE]

- [4 pts] 2. List all zeroes of $p(x) = (2x - 5)(x + 1)^3(x^2 - 3)$ AND their multiplicity.

$$x = \frac{5}{2} \quad \text{mult} \quad 1$$

$$x = -1 \quad \text{"} \quad 3$$

$$x = \sqrt{3} \quad \text{"} \quad 1$$

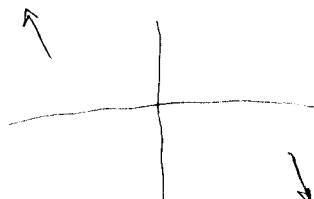
$$x = -\sqrt{3} \quad \text{"} \quad 1$$

$$p(x) = (2x - 5)(x + 1)^3(x - \sqrt{3})(x + \sqrt{3})$$

3. Let $f(x) = -4x^3 + 24x^2 - 36x$, answer the following questions about $f(x)$:

[2 pts]

(a) Describe the end behavior of $f(x)$ (you can use a picture).



[2 pts]

(b) Determine if f is even, odd or neither. Explain

Neither since we have even & odd exp.

[3 pts]

(c) Find the x and y -intercepts of the graph of $f(x)$.

$$f(0) = 0$$

$$f(x) = -4x(x^2 - 6x + 9)$$

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

$$x\text{-int.} \quad x = 0, 3$$

$$(0, 0), (3, 0)$$

$$y\text{-int.} \quad 0$$

4. Given the rational function $h(x) = \frac{(4x+8)(x^2+2x+1)}{(x^2-4)(3x+9)}$ answer the following questions about h .

[6 pts]

- (a) Determine if the graph of h has any holes or asymptotes. If so, give the equation of the asymptotes and state the location of the holes.

$$h(x) = \frac{4(x+2)(x+1)^2}{3(x+3)(x-2)(x+2)}$$

holes at $x = -2$

V. as at $x = -3, x = 2$

hor. As at $y = 4/3$

[4 pts]

- (b) Give the x and y -intercepts.

x -int at $x = -1$

y -int $y = \frac{8}{-4 \cdot 9} = -\frac{2}{9}$

[2 pts]

- (c) State the domain of $h(x)$.

$x \neq \pm 2, -3$

5. A carousel (or merry go round) has a line of 6 horses, evenly spaced along the perimeter, 4m from its center.

- [5 pts] (a) If it goes at 8 revolutions per minute. Calculate the angular and linear speed of the horses.

$$\text{Ang. speed: } 8(2\pi) \text{ radians per minute} \\ = 16\pi$$

$$\text{Lin. speed } 8 \cdot 4(2\pi) = 64\pi \text{ m/min.}$$

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- [1 pts] (b) If the two most popular horses are next to each other, find the measure of the acute angle formed by the horses with vertex at the center of the ride.

$$\angle \leftarrow \frac{2\pi}{6} = \frac{\pi}{3}$$

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- [2 pts] (c) Give the sine and cosine values of the angle you found in question (5b).

$$\sin\left(\frac{\pi}{3}\right) = \frac{\sqrt{3}}{2}$$

$$\cos\left(\frac{\pi}{3}\right) = \frac{1}{2}$$

6. Let $f(x) = -2\sin(3x + 4)$.

[2 pts]

(a) Find the amplitude of f .

$$|A| = 2 \leftarrow \text{Amplitude}$$

[2 pts]

(b) Give the phase-shift of f .

$$\frac{|C|}{B} = \frac{4}{3}$$

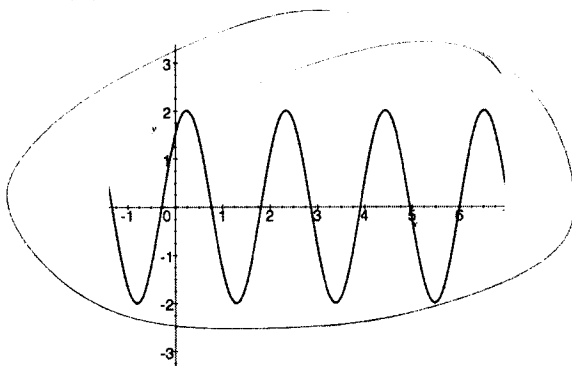
[2 pts]

(c) State the period of f .

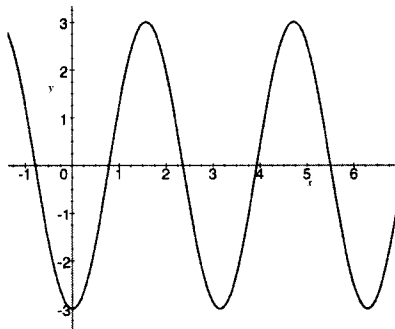
$$\frac{2\pi}{B} = \frac{2\pi}{3}$$

[2 pts]

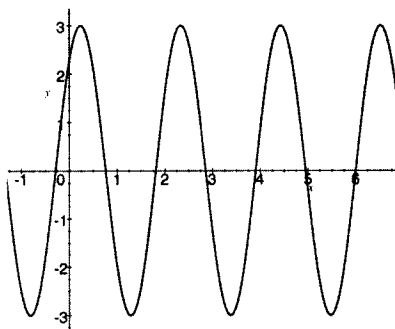
(d) Choose, from the following, the graph of f . Clearly indicate your choice.



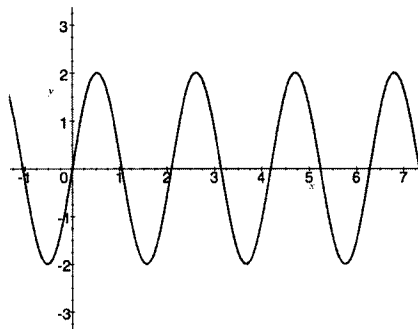
[X]



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