MCT4C Final Exam

Name: _____ Date: _____

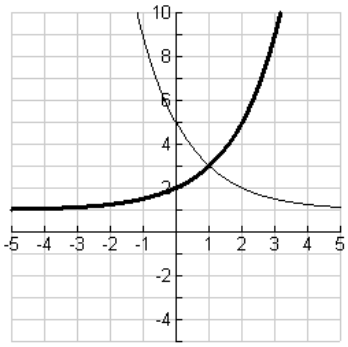
Part A: Multiple Choice

Choose the best answer. Record your answer in the space provided in capital letters.

1. _____ The polynomial function $f(x) = x^3 - 4x + 6$ is

   A) linear
   B) quadratic
   C) cubic
   D) quartic

2. _____ The solution to the system of 2 equations whose graphs are given on the right is:



   A) 1
   B) 2
   C) 3
   D) 5

3. _____ $\log_2 25$ is approximately

   A) 4
   B) 4.4
   C) 4.6
   D) 5

4. _____ $\log_3 2187 = 7$ can be expressed as

   A) $3^7 = 2187$
   B) $3^{2187} = 7$
   C) $7^3 = 2187$
   D) $7^{2187} = 3$

5. _____ Given $f(x) = 5 - 8x^3 - 2x^4 + 10x$, the maximum number of x-intercepts is

   A) 1
   B) 3
   C) 4
   D) 8

6. _____ The exact solution to $x^5 = 8$ is

A) $\frac{8}{5}$
B) 8^5
C) 5^8
D) $8^{\frac{1}{5}}$

7. _____ The exact value of $\cos 30°$ is

A) $\frac{\sqrt{3}}{2}$
B) $-\frac{\sqrt{3}}{2}$
C) $\frac{2}{\sqrt{3}}$
D) $\frac{1}{\sqrt{3}}$

8. _____ If $\sin\theta = 0.8829$, then the approximate measure of θ between $0°$ to $360°$ is

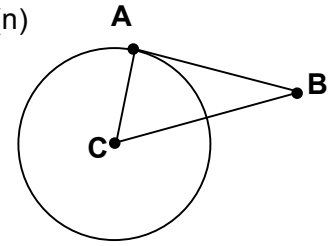
A) $62°,\ -28°$
B) $62°,\ 28°$
C) $62°,\ -118°$
D) $62°,\ 118°$

9. _____ A vector is a quantity which has a magnitude and _____.

A) displacement
B) velocity
C) position
D) direction

10. _____ For the following diagram where **C** is the centre, **AB** is a(n)

A) arc
B) chord
C) diameter
D) tangent



MCT4C Final Exam

Part B: Short Answers

11. For the expression $\frac{\left(5a^3b^2\right)^2}{5\left(4a^4b^6\right)^{\frac{1}{2}}}$ simplify first. Then evaluate the expression if $a = -2$ and $b = 3$.

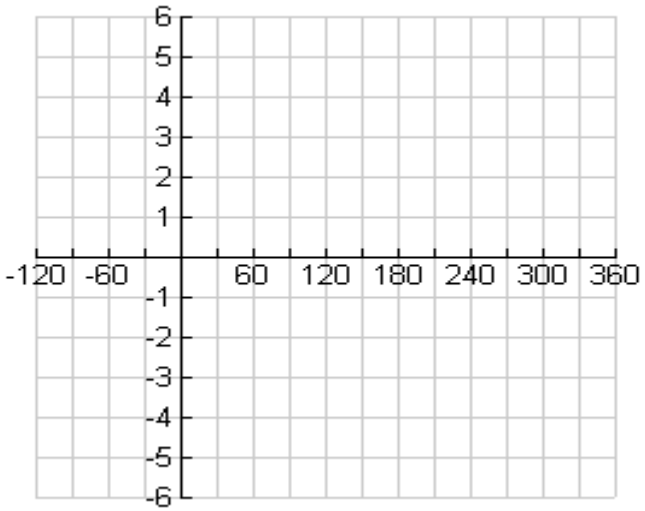
12. Solve $16^{2x+4} = 4^{x-4}$.

13. Solve $2x^3 - 4x^2 - 6x = 0$.

14. Expand and simplify $-3xy^2\left(6x^2y^3 - 1\right) + 10xy^2$.

15. For the function $f(x) = 4\sin[3(x - 60)] - 1$,

a. Sketch one cycle of the graph.



b. Complete the table based on the given graph.

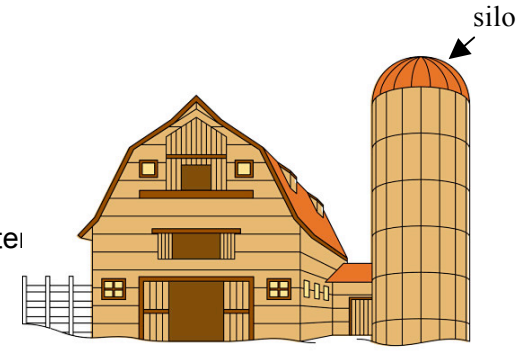
Amplitude	Period	Phase Shift	Vertical Translation

16. Determine the direction (as a bearing), correct to the nearest degree and the magnitude of the resultant vector to represent the displacement of a ship that travels 6 km south, 8 km west.

MCT4C Final Exam

Part C: Full Solutions

17. A silo is composed of a cylinder and a semi-sphere. Refer to the sketch. Given the height of the cylindrical portion is 21.5m and the diameter is 8m:



a. How much grain will the silo hold, correct to the nearest te

b. How much sheet metal is needed to construct this silo, correct to the nearest tenth of a square metre?

18. Jonathan and Alanna are using rope to pull their car that is stuck in the snow. Alanna pulls directly forward with a force of 500N while Jonathan pulls with a force of 800 N at an angle of $60°$. What is the resultant force used on the car?

MCT4C Final Exam

Name: _____ Date: _____

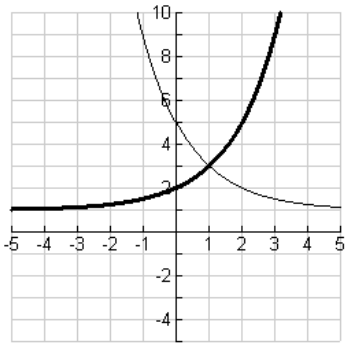
Part A: Multiple Choice

Choose the best answer. Record your answer in the space provided in capital letters.

19. __C__ The polynomial function $f(x) = x^3 - 4x + 6$ is

A) linear
B) quadratic
C) cubic
D) quartic

20. __C__ The solution to the system of 2 equations whose graphs are given on the right is:



A) 1
B) 2
C) 3
D) 5

21. __C__ $\log_2 25$ is approximately

A) 4
B) 4.4
C) 4.6
D) 5

22. __A__ $\log_3 2187 = 7$ can be expressed as

A) $3^7 = 2187$
B) $3^{2187} = 7$
C) $7^3 = 2187$
D) $7^{2187} = 3$

23. __C__ Given $f(x) = 5 - 8x^3 - 2x^4 + 10x$, the maximum number of x-intercepts is

A) 1
B) 3
C) 4
D) 8

24. ___D___ The exact solution to $x^5 = 8$ is

A) $\frac{8}{5}$
B) 8^5
C) 5^8
D) $8^{\frac{1}{5}}$

25. ___A___ The exact value of $\cos 30°$ is

A) $\frac{\sqrt{3}}{2}$
B) $-\frac{\sqrt{3}}{2}$
C) $\frac{2}{\sqrt{3}}$
D) $\frac{1}{\sqrt{3}}$

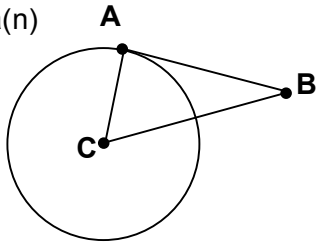
26. ___D___ If $\sin\theta = 0.8829$, then the approximate measure of θ between $0°$ to $360°$ is

A) $62°,\ -28°$
B) $62°,\ 28°$
C) $62°,\ -118°$
D) $62°,\ 118°$

27. ___D___ A vector is a quantity which has a magnitude and _____.

A) displacement
B) velocity
C) position
D) direction

28. ___D___ For the following diagram where **C** is the centre, **AB** is a(n)



A) arc
B) chord
C) diameter
D) tangent

MCT4C Final Exam

Part B: Short Answers

29. For the expression $\frac{(5a^3b^2)^2}{5(4a^4b^6)^{\frac{1}{2}}}$ simplify first. Then evaluate the expression if $a = -2$ and $b = 3$.

$= \frac{25a^6b^4}{5(2a^2b^3)}$

$= \frac{5a^4b}{2}$

$= \frac{5(-2)^4(3)}{2}$

$= 120$

30. Solve $16^{2x+4} = 4^{x-4}$.

$(2^4)^{2x+4} = (2^2)^{x-4}$
$2^{8x+16} = 2^{2x-8}$
$8x + 16 = 2x - 8$
$6x = -24$
$x = -4$

31. Solve $2x^3 - 4x^2 - 6x = 0$.

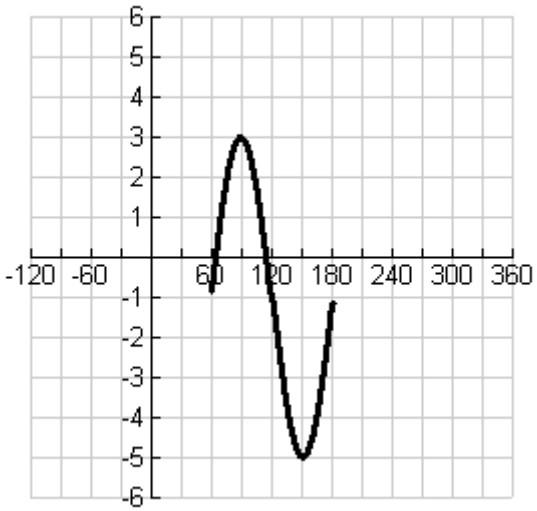
$2x(x^2 - 2x - 3) = 0$
$2x(x - 3)(x + 1) = 0$
$x = -1, 0, 3$

32. Expand and simplify $-3xy^2(6x^2y^3 - 1) + 10xy^2$.

$= -18x^3y^5 + 3xy^2 + 10xy^2$
$= -18x^3y^5 + 13xy^2$

33. For the function $f(x) = 4\sin[3(x - 60)] - 1$,

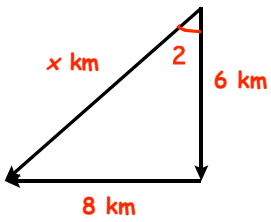
c. Sketch one cycle of the graph.



d. Complete the table based on the given graph.

Amplitude	Period	Phase Shift	Vertical Translation
4	*120°*	*Right 60°*	*Down 1*

34. Determine the direction (as a bearing), correct to the nearest degree and the magnitude of the resultant vector to represent the displacement of a ship that travels 6 km south, 8 km west.



$x^2 = 6^2 + 8^2$
$x^2 = 100$
$x = 10$

$\tan\theta = \frac{8}{6}$

$\theta = 53°$

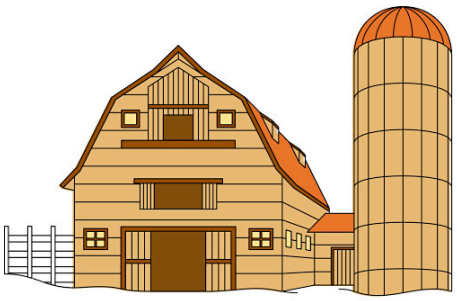
bearing = 180° + 53°
= 233°

Therefore, the ship's displacement is 10 km on a bearing off 233°.

MCT4C Final Exam

Part C: Full Solutions

35. A silo is composed of a cylinder and a semi-sphere. Refer to the sketch. Given the height of the cylindrical portion is 21.5m and the diameter is 8m:



c. How much grain will the silo hold, correct to the nearest tenth of a cubic metre?

$V = \pi r^2 h + \frac{1}{2}\left(\frac{4}{3}\right) \pi r^3$

$V = \pi(4)^2 (21.5) + \frac{2}{3} \pi(4)^3$

$V = 344\pi + \frac{128}{3} \pi$

$V = 1214.749\ 159\ 288\ m^3$

Therefore, the silo should hole approximately 1214.7 m^3 of grain.

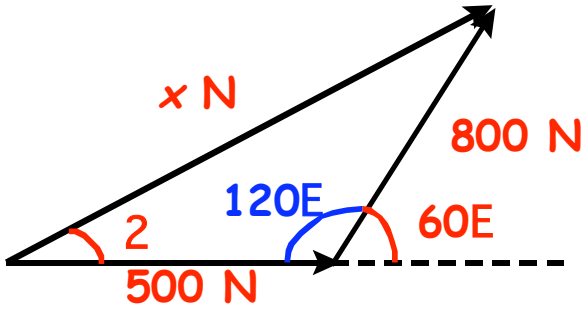
d. How much sheet metal is needed to construct this silo, correct to the nearest tenth of a square metre?

$SA = 2\pi r h + 0.5(4 \pi r^2)$
$SA = 2\pi(4)(21.5) + 2\pi(4)^2$
$SA = 204\pi$
$SA = 640.884\ 901\ 332$

Therefore, approximately 640.9 m^2 of sheet metal is required to construct this silo.

MCT4C Final Exam

36. Jonathan and Alanna are using rope to pull their car that is stuck in the snow. Alanna pulls directly forward with a force of 500N while Jonathan pulls with a force of 800 N at an angle of $60°$. What is the resultant force used on the car?



$x^2 = (800)^2 + (500)^2 - 2(500)(800)\cos 120$
$x^2 = 890\,000 - 800\,000 \cos 120$
$x^2 = 1\,290\,000$
$x = 1135.781\,669$
$x = 1136N$

$$\frac{\sin\theta}{800} = \frac{\sin 120}{x}$$

Sin θ = $\dfrac{800\sin 120}{1136}$

Sin θ = 0.609 942 81
θ = 37.589 089 47

Therefore, the resultant force is approximately 1136 N at an angle of approximately 38 ° to the horizontal.