

1. **This operation is the fibre derivative of a hyper-regular function on a tangent bundle that is a diffeomorphism to the cotangent bundle. This operation is used to obtain the generating functional of one-particle-irreducible Schwinger functions, known as the effective action. A change of sign is necessary in this operation when it is used to convert between thermodynamic potentials. It yields the maximum separation between a linear function, $p \cdot x$, and a convex function, f of x , as a function of p . This (*) involutive operation is often introduced in classical mechanics as switching the kinetic energy from depending on velocity to depending on momentum.** For 10 points, name this useful physics tool that transforms functions on a vector space to functions on the dual space and which is used to transform the Lagrangian to the Hamiltonian.

ANSWER: Legendre-Frenchel transformation

2. **A work by this composer instructs the cellists to hold their instruments across their knees and to imitate a guitar using the nails of their hand. He wrote a concerto which was very loosely arranged by Friedrich Grützmacher, who borrowed from some of his other concertos to make the arrangement. A work by this composer begins with a movement representing an Ave Maria bell and ends with a movement representing the retreat of a military night watch. His Spain-inspired music includes the (*) Fandango quintet and *Night Music of the Streets of Madrid*. His most famous movement was popularized by the 1955 movie *The Ladykillers*, and is the third movement of his String Quintet in E Major.** For 10 points, name this Italian composer of many string quartets and quintets, one of which features a celebrated minuet.

ANSWER: Luigi Boccherini

3. **Frank Zimring's book about this phenomenon uses Canada as a control group to rule out some popular explanations for it. Jessica Reyes argued that this phenomenon was caused by the removal of lead from gasoline and paint as part of the Clean Air Act of 1970. A paper by Jonathan Klick noted that it was directly correlated to the rise and proliferation of mobile phones. More traditional explanations for this phenomenon include the widespread use of programs like (*) CompStat to identify hot spots. Joseph Stiglitz has argued against the claim that it was caused by the growth of mass incarceration, while Steven Levitt acknowledged the role of incarceration but found a more significant link to the legalization of abortion.** For 10 points, name this trend which has run from 1995 to the present and is often illustrated through changes in murder rate.

ANSWER: American crime decline [or: obvious equivalents]

4. **A chapter of this novel consists almost entirely of Ernulphus's curse on a character for tying some knots. This novel is dedicated to the moon because it drives people insane, but the narrator notes that the dedication in the next edition can be bought for 50 guineas. This novel includes the story of Diego, a man whose enormous nose causes an uproar in Strasbourg. A character in this novel becomes obsessed with the study of (*) projectiles after studying the siege of Namur. This novel is described as a story about a Cock and a Bull by Yorick. At the moment of its title character's conception, his mother asks his father if he remembered to wind the clock, but the title character's birth does not come until the third volume.** For 10 points, name this digressive novel by Laurence Sterne.

ANSWER: *The Life and Opinions of* Tristram Shandy, Gentleman

5. This philosopher introduced thought experiments involving fading qualia and dancing qualia in response to thought experiments involving absent qualia and inverted qualia which were used to argue against his principle of organizational invariance. His best-known paper explores a double-aspect theory based on Shannon's information theory and introduces what he calls the principle of structural coherence. He formulated an argument whose conclusion is that either (*) Russellian monism is true or physicalism is false. He espouses what he calls a naturalistic dualism, partially on the basis of the premise that philosophical zombies are conceivable. For 10 points, name this Australian philosopher of mind who formulated the hard problem of consciousness.

ANSWER: David Chalmers

6. This city's government put down the populist Conspiracy of Cinadon, provoked by rising inequality here that worsened with the Law of Epitadeus. This city tried to secure itself against enemies by allying with Amyntas III to tear down the Chalcidian League, and by supporting Phoebeidas and Sphodrias' illegal land seizures from foreign powers. This city subordinated the Aegean Islands by appointing harmost-led (*) decarchies to control their cities. This city's excessive foreign adventuring taught its enemies how to defeat it at the Battle of Tegyra, a precursor to a battle in which another city used a phalanx with an extra-deep left wing to destroy this city's army under Cleombrotus. For 10 points, name this Greek city-state whose hegemony lasted from 404 to 371 B.C., after its victory in the Peloponnesian War.

ANSWER: Sparta

7. In a flashback in one film of this type, a paralyzed, nearly-blind man suffering from syphilis is carried up a Norwegian mountain by a friend, to see the sun set one last time. Another film alternately considered of this type or anti- this type has Gustav Leonhardt play the husband of the title character and was directed by Jean-Marie Straub and Danièle Huillet. In a scene from that first film of this type, Percy Grainger tosses a tennis ball over a house and runs through the house to catch it. A prolific director of films in this genre was Ken Russell, whose (*) *Song of Summer* takes place after Eric Fenby becomes the amanuensis of Frederick Delius. For 10 points, name these films, such as *The Chronicle of Anna Magdalena Bach* and Milo Forman's *Amadeus*, that dramatize the life of people who wrote classical music.

ANSWER: composer biopics [or: composer anti-biopics; or obvious equivalents, such as: dramatized biographical films of composers, dramatized documentaries of composers; prompt on: biopics , biographical films , films about composers]

8. The minimum viable size of these things can be defined by the inequality $P\text{-hat} \sqrt{H}$ is greater than or equal to three. The incidence function model of these things was developed by Ilkka Hanski. Their dynamics can be modeled with sources of positive growth rate and sinks of negative growth rate, reflecting suitability. Their persistence is affected by connectivity between (*) patches, which is a major focus of conservation biology in the form of corridors. Hanski incorporated the rescue effect into Richard Levins' model of these things, in which they are conceived as a simple stochastic balance between local extinction and colonization of suitable habitat patches. For 10 points, identify this term applied to spatially isolated assemblages of organisms that are linked by migration and extinction.

ANSWER: metapopulations [prompt on: populations , metacommunities]

9. According to legend, this city was built where the caliph's dogs stopped and refused to chase a stag. It was the location where Shaykh Tusi founded the first clerical seminary known as the Hawza. Ayatollah Khomeini spent most of his fourteen year exile in this city. One site here was chosen at the spot where a white camel carrying a corpse chose to rest. It is largely surrounded by the Wadi al-Salaam, which is legendarily situated on land bought by Abraham and thought to be the largest cemetery in the world. The primary attraction in this city is the Mausoleum of (*) Husayn ibn Ali, which was built here after his death at nearby Karbala. For 10 points, name this headquarters of the cleric Muqtada al-Sadr, an Iraqi city which is one of the most holy sites in Shia Islam.

ANSWER: Najaf

10. On one of these occasions, a character gives his sister-in-law a history of the last fifty years of their high school. The philosophical lieutenant-colonel Vershinin visits the main characters during that occasion, which is also the one-year anniversary of their father's death. Act I of *Three Sisters* takes place on one of these occasions. In another work, the protagonist is invited to one of these celebrations under the pretense that it will be a small party, but it turns out to be a (*) rowdy ball. The protagonist dances with his friend's fiancée, Olga Larina, at that event. Lensky challenges Eugene Onegin to a duel during one of these celebrations for Tatyana. For 10 points, name this type of celebration, similar to a birthday, which was popular in 19th-century Russia.

ANSWER: name day celebrations

11. This writer was the first contributor to the Future Library Project by writing a manuscript in 2014 which will be published in 2114. A novel by this author includes the story of the Peach Women of Aa'a, perfect women who grow on trees like peaches. That novel by this author opens with the suicide of the sister of the narrator, who is the daughter of a button-factory owner and has an affair with the writer (*) Alex Thomas, leading to the suicide of her husband Richard Griffen. A story-within-a-story about children who are forced to make carpets until they can no longer see provides the title of this author's novel about the life of Iris Chase. For 10 points, name this author of *The Blind Assassin*, who also wrote *The Handmaid's Tale*.

ANSWER: Margaret (Eleanor) Atwood

12. In mass spectrometry, a cleavage described by this term produces a resonance-stabilized carbocation. This term describes a class of hydroxy acids that are used as exfoliating agents that are distinct from BHAs. Bromine, phosphorus, and a carboxylic acid are reacted in the Hell-Volhard-Zelinsky reaction to create brominated acids described by this term. Resonance-stabilized enolates are formed when a hydrogen (*) described by this term is abstracted. The first step of the Claisen and aldol condensations involve the removal of a proton described by this letter. For 10 points, name this Greek letter that denotes the carbon or hydrogen nearest to a carbonyl group.

ANSWER: alpha [prompt on: α-position]

13. Several angles of this building were compared with similar shots of an older building in Robin Hill's June 2015 photography series *Side by Side*. Fujiko Nakaya's project *Veil* used six hidden nozzles to envelop this building with mist for 15 minutes out of every hour. One of the three versions of Nicolas Poussin's *The Funeral of Phocion* rests on an easel mount in this building, where it serves as a sort of screen that sets off a white carpeted living room decorated with a Mies van der Rohe leather furniture set. An underground art gallery styled after Agamemnon's Tomb lies near this building and contains the collection its architect assembled with (*) David Whitney. The floor of this building is raised brick in a herringbone pattern, except for its small bathroom enclosed in a brick cylinder. For 10 points, name this house which was designed by Philip Johnson to replace walls with windows.

ANSWER: Glass House

14. **A new electoral system proposed by this prime minister awards 54% of seats in the Chamber of Deputies to any party that can obtain 40% of the vote. This prime minister replaced the porcellum and ended the status quo of perfect bicameralism. With assistance from the EU, this leader's country began Operation Triton to combat the rise of (*) migrant shipwrecks. This leader's country was the site of anti-austerity protests on May Day that marred Expo 2015. This leader made the Nazareno Pact with a former prime minister who was convicted of tax fraud. This leader, who took office after the resignation of Enrico Letta, held a press conference with his buddy Angela Merkel in front of Michelangelo's *David*. For 10 points, name this current Prime Minister of Italy.**

ANSWER: Matteo Renzi

15. **A group based in this country supposedly rubbed cocaine into their soldiers' open cuts to make them fearless during fighting. Loyalists from this country's army supported that group during a looting spree colloquially known as Operation Pay Yourself. This country's capital was evacuated by British forces in Operation Palliser. The memoir *A Long Way Gone* by (*) Ishmael Beah describes this country's civil war, which led to the signing of the Lomé Accords. Foday Sankoh led a rebel group in this country that was supported by a neighboring country's NPFL under Charles Taylor. That group, the Revolutionary United Front, used child soldiers to mine diamonds during this country's civil war. For 10 points, name this southeastern neighbor of Liberia led from Freetown.**

ANSWER: Sierra Leone

16. **This artist painted his brother Martial, who was a noted philatelist, playing the piano, and showed his other brother René looking out from his balcony in *Young Man at His Window*. He showed a male nude towel-drying himself off in *Man at His Bath*. This artist wears a straw hat and straddles a chair backwards in Renoir's *Luncheon of the Boating Party*. A painter carrying a (*) ladder can be seen in the background of one of this artist's works, which is divided in half by a green lamppost. In the foreground of that painting is a well-dressed couple sharing an umbrella. This artist attracted controversy for the realism of his painting *The Floor Scrapers*. For 10 points, name this painter of *Paris Street, Rainy Day*.**

ANSWER: Gustave Caillebotte

17. **The one-line model of these structures's evolution is derived from mathematical theories about the conservation of their profile developed by Pélard-Considère. A simple method for creating a profile of these structures uses stakes connected to a rope of known length, which is K. O. Emery's board method. The smallest separation between horns is possessed by the reflective type of rhythmic cusps on these structures. Their namesake face extends to the berm crest. These structures exhibit an alternating pattern of ridges and runnels. Their (*) nourishment, or reclamation, is often accomplished with dredging. Particles in these structures undergo a characteristic zig-zag pattern of movement due to longshore drift. For 10 points, name these transitional coastal structures that often consist of sand.**

ANSWER: beaches [prompt on: coasts , coastal zones , coastal structures , shorelines]

18. **One character in this novel telephones her husband from a bar in Montgomery to ask him to look up the recipe to an Alabama Slammer. A child in this novel is terrified of a white dog that she sees and hears everywhere. Another of its characters is Bayonet Melville, whose yacht *Tough Baby* was originally built for Hitler and smashes seventeen boats during Hurricane Bob. After his wife Petal abandons him and tries to sell his children (*) Bunny and Sunshine, this novel's protagonist joins his upholsterer aunt and moves to his family's ancestral home at the town of Killick-Claw on Newfoundland. That protagonist, Quoye, gets a job as a reporter for the *Gammy Bird* writing the title column. For 10 points, name this 1993 Pulitzer Prize winning novel by Annie Proulx.**

ANSWER: *The* Shipping News

19. In one story from this country, two lovers turn into butterflies after one jumps into the other's grave. In another folktale from this country, a woman born out of a calabash destroys the stone edifice holding her husband's bones by weeping. In a more famous story from this country, a man kills his ox to use its hide to fly into the sky and become the star Altair. In that story from this country, a flock of (*) magpies form a bridge on the seventh day of the seventh month every year to reunite the Cowherd and the Weaver Girl. In the mythology of this country, ten suns filled the sky before nine were shot by the archer Yi. For 10 points, name this country with mythical heroes include the engineer Yu the Great and the monkey king Sun Wukong.

ANSWER: China

20. This president's administration falsely charged three Irish nationalists for an attack on a Jewish restaurant in Vincennes. This man's physician, Claude Gubler, was prosecuted after revealing in his book *The Grand Secret* that this man faked medical records to hide his prostate cancer. In a speech given at La Baule, this man spoke of a southern wind blowing over (*) Africa. Fernando Pereira was killed during an operation ordered by this president's government. This president ordered Operation Turquoise in response to a plane crash in Rwanda. This man, whose intelligence services bombed the *Rainbow Warrior*, was forced into the first cohabitation period after appointing Jacques Chirac as Prime Minister. For 10 points, name this Socialist who ruled for fourteen years as President of France.

ANSWER: François (Maurice Adrien Marie) Mitterrand

1. In what became known as the Nut Rage Incident, the daughter of this company's CEO had one of its employees dismissed after he served nuts in a bag instead of on a plate. For 10 points each:

[10] Name this airline, whose Flight 007 was shot down by the Soviet Union near Sakhalin Island in 1983.

ANSWER: **Korean Air Lines Co. Ltd.**

[10] Korean Air is considered a business known by this term. It describes large conglomerate businesses that were often controlled by one family and benefited under guided capitalism.

ANSWER: **chaebol**

[10] North Koreans Kim Hyon Hui and her male partner blew up Korean Air Flight 858 to discourage teams attending this event in Seoul in 1988. 1980's iteration of this event was boycotted by the U.S. in response to the Soviet invasion of Afghanistan.

ANSWER: the Summer **Olympics** [or: **Olympic Games**; do not accept: Winter Olympics]

2. Aimé Césaire wrote a post-colonial adaptation of this play in which Caliban rejects his name and calls himself X. For 10 points each:

[10] Name this play whose characters of Ariel and Caliban also inspired an essay by José Enrique Rodó.

ANSWER: **The Tempest**

[10] Aimé Césaire was from this French-owned island. Another post-colonialist writer from this island wrote an anti-imperialist book with a notable introduction by Jean-Paul Sartre.

ANSWER: **Martinique**

[10] Patrick Chamoiseau's *Texaco* is probably the most famous novel to come out of this movement, founded in opposition to Negritude by Martinican authors such as Chamoiseau, Jean Bernabé and Raphaël Confiant.

ANSWER: **créolité** [or: **creoleness**]

3. In *Das Kapital*, Marx uses this figure as an exemplar of a pre-capitalist agent, producing goods for his own use instead of for profit. For 10 points each:

[10] Identify this figure, who names an economic model which assumes a single consumer and a single producer.

ANSWER: **Robinson Crusoe** [accept either name]

[10] Another island-based economic model was developed by Peter Diamond, which involves islanders harvesting and trading this commodity.

ANSWER: **coconuts**

[10] The Diamond coconut model has been used to argue that there is not a unique natural rate of this, contra Milton Friedman. There are frictional and structural types of this phenomenon.

ANSWER: **unemployment**

4. Answer the following about the work of Donald Lynden-Bell, for 10 points each.

[10] Lynden-Bell proposed this process, which occurs when a time-dependent potential changes on a timescale comparable to the dynamical timescale. It rapidly establishes a virial equilibrium in two-body collisionless systems and, importantly, allows a change in energy independent of a galaxy's mass.

ANSWER: **violent relaxation**

[10] Lynden-Bell was among the Seven Samurai of astronomy, headed by Sandra Faber, that surveyed 400 elliptical galaxies and found this huge concentration of mass beyond the Milky Way's Zone of Avoidance.

ANSWER: **Great Attractor**

[10] Lynden-Bell more fully developed the theory of accretion disks around these objects first put forth by Salpeter and Zeldovich. These objects are thought to be in the center of most massive galaxies.

ANSWER: **supermassive black holes** [or: **SMBHs**, **gigantic black holes**; prompt on: **black holes**]

5. This man's playing career was ended by dental complications caused by eating too many sugar sandwiches, which are exactly what they sound like. For 10 points each:

[10] Name this early American cornet player who wrote the songs "Dippermouth Blues" and "Doctor Jazz".

ANSWER: King Oliver [or: Joseph Nathan Oliver]

[10] King Oliver mentored this trumpeter who was known as Satchmo and who employed scat singing on "What a Wonderful World".

ANSWER: Louis Armstrong

[10] "Doctor Jazz" lent its name to an album by this pianist who claimed to have invented jazz in 1902. This leader of the Red Hot Peppers composed "King Porter Stomp" and "Dead Man Blues".

ANSWER: Jelly Roll Morton

6. The marketing principle, transportation principle, and administrative principle all yield different layouts in this theory. For 10 points each:

[10] Name this theory propounded by Walter Christaller that attempts to explain how urban settlements are spaced and sized in relation to one another. It was later expanded in a "bottom-up" fashion by August Losch.

ANSWER: central place theory [or: CPT]

[10] The area adjacent to a central place is known by this term, which, in von Thünen's model, is divided into concentric zones around a market center. Harold Innis's staple thesis characterizes Canada as this term, exporting staples to enrich the heartland.

ANSWER: hinterland [or: sphere of influence, tributary region, trade area, urban field, nodal region, area of influence, catchment area, service area]

[10] In von Thünen's model, the outermost concentric zone is used to raise this commodity. The invention of barbed wire revolutionized the production of this commodity in the American west.

ANSWER: livestock [or: cattle, sheep, obvious equivalents]

7. *The Vertigo of Eros* is an example of a painting in this genre. For 10 points each:

[10] Name this term used by the Chilean painter Roberto Matta to refer to landscapes which he considered projections of his psyche. It shares its name with a concept invented by Gerard Manley Hopkins.

ANSWER: inscapes

[10] Roberto Matta may have contributed to this painter's decision to commit suicide by sleeping with his wife. This Armenian painted *The Liver Is the Cock's Comb* and a celebrated portrait of his mother.

ANSWER: Arshile Gorky [or: Vostanik Manoug Adoian]

[10] In Gorky's portrait of his mother, these objects are left unfinished. Two of these objects emerge from a piece of paper in a print by Escher, who also made a print of one of these objects with a reflecting sphere.

ANSWER: hands

8. The first law of thermodynamics requires that the internal energy be this kind of differential. For 10 points each:
[10] Name this type of differential that has a path independent line integral. In 2-dimensions, a differential is of this type if the second derivative of both terms in its total derivative definition are equal.

ANSWER: **exact** differential

[10] The differential of the internal energy is the difference between the inexact differentials of these two quantities according to the first law of thermodynamics. These two quantities are typically represented as Q and W.

ANSWER: **heat** added to the system and **work** done by the system [or: obvious equivalents that include **heat** and **work**]

[10] This Italian scientist introduced classification diagrams that, in simplest form, divide variables into two columns based on whether they are configuration or source variables, then shows linkages within a column, which are topological laws, and across columns, which are constitutive laws.

ANSWER: Enzo **Tonti**

9. This character claims he survived pneumonia in the summer of 1941 by wrestling Death for three days and three nights. For 10 points each:

[10] Name this character whose motto "You got to take the crooked with the straights" is repeated by his son Lyons.

ANSWER: **Troy** Maxson

[10] Former baseball player Troy Maxson is the protagonist of this August Wilson play.

ANSWER: **Fences**

[10] August Wilson liked to claim that his influences were Amiri Baraka, Jorge Luis Borges, Romare Bearden, and this musical style practiced by the characters of *Ma Rainey's Black Bottom*.

ANSWER: the **Blues**

10. Many of these occurrences were the result of high military spending, especially after the loss of the massive Armada in 1588. For 10 points each:

[10] Identify these occurrences that happened in 1557, 1560, 1569, 1575, and 1596, when Philip II could no longer pay off the debts accrued by his predecessor, Charles V.

ANSWER: Spain declaring **bankruptcy** [or: **defaulting** on loans; obvious equivalents]

[10] A year after the 1575 bankruptcy, tercios under Sancho d Avila angry about low salaries decided to sack this city. This city was conquered a decade later by Alexander Farnese.

ANSWER: **Antwerp** [or: **Antwerpen**]

[10] A loan granted by Poland-Lithuania to Philip II was named for this city. A revolt of this city's fishermen against its Spanish rulers inspired *The Mute Girl of Portici* and started after a tax on fruit was implemented.

ANSWER: **Naples** [or: **Napoli**]

11. The third book of Ovid's *Ars Amatoria* describes this man's tragic story, in which he returned home after eight years and tested his wife's faithfulness by trying to seduce her. For 10 points each:

[10] Name this man who did successfully seduce his wife. When his wife, in return, spied on him while he was hunting, he inadvertently killed her with his never-missing spear.

ANSWER: **Cephalus**

[10] With her dying words, Cephalus' wife Procris made him promise not to marry this goddess of the dawn, with whom he had spent eight years as a lover.

ANSWER: **Eos** [or: **Aurora**]

[10] According to Hesiod's *Theogony*, Cephalus and Eos had a son of this name who became Aphrodite's lover. Another mythical figure with this name drowned in the Eridanus river, provoking his seven sisters to cry until they became amber-dripping poplar trees.

ANSWER: **Phaethon**

12. Answer the following about the color of blood in non-human organisms, for 10 points each.

[10] Crustaceans and some marine molluscs, such as octopi and squid, have oxygenated blood of this color because hemocyanin, their oxygen-transporting protein, contains copper in the active site.

ANSWER: **blue** [or: obvious equivalents; prompt on: **cyan**]

[10] The violet-pink blood of the marine invertebrate phyla *Sipuncula* and *Brachiopoda* is due to the oxygen-transporting protein hemerythrin, which contains iron atoms bound to this nitrogen-containing ring in histidine residues.

ANSWER: **imidazole** ring [or: **1,3-diazole**]

[10] Hemocyanin is structurally nearly identical to this two-copper-atom-containing enzyme that produces melanin.

ANSWER: **tyrosinase** [prompt on: **TYR**]

13. Jerry Stiller plays one of these characters who constantly falls asleep, Dennis O'Hare plays one who insists that everyone gives blood, and Ana Gasteyer plays one who demands that each proffer of an opinion be accompanied by the phrase "in my opinion." For 10 points each:

[10] Name these recurring guest roles on a CBS drama.

ANSWER: **judges** on *The **Good Wife***

[10] Jerry Stiller is better known for shouting "serenity now!" and inventing Festivus as this character's father on *Seinfeld*.

ANSWER: **George** Constanza

[10] This actor played the basketball playing judge Edward Weldon on *The Good Wife*. He played Martin Luther King Jr. in *Selma*.

ANSWER: David **Oyelowo**

14. Name some things about failed Constitutional amendments, for 10 points each:

[10] This amendment, which would have required a national referendum before a declaration of war could be made, was debated in the wake of the *Panay* incident.

ANSWER: **Ludlow** Amendment

[10] This 1861 amendment was introduced in the Senate by William H. Seward. It would have prohibited even a Constitutional amendment from abolishing or interfering with any state or its domestic institutions thereof.

ANSWER: **Corwin** Amendment

[10] This amendment, which was originally written by Alice Paul, came three states short of ratification in 1977.

ANSWER: **Equal Rights Amendment** [or: **ERA**]

15. Answer the following about essays on free speech, for 10 points each.

[10] This author said that a good book is the precious lifeblood of a master spirit in his tract against censorship, *Areopagitica*.

ANSWER: John **Milton**

[10] This critic wrote the essay *There's No Such Thing as Free Speech and It's a Good Thing Too*. He wrote *How Milton Works* and *Surprised by Sin* about Milton and developed the concept of interpretive communities.

ANSWER: Stanley **Fish**

[10] This George Orwell essay recounts a meeting of the PEN Club which ostensibly defended freedom of the press, though Orwell says that it was really a defense of censorship.

ANSWER: The **Prevention of Literature**

16. This operation produces zero when applied to a matrix A minus the eigenvalues of A times the identity matrix. For 10 points each:

[10] Name this matrix operation defined for square matrices that, for the 2-by-2 matrix $\begin{bmatrix} a & b \\ c & d \end{bmatrix}$, is equal to a minus b c .

ANSWER: **determinant** [or: **det**]

[10] The eigenvalues of this type of matrix are the entries on the main diagonal. The LU decomposition factors a square matrix into a lower and an upper one of these matrices.

ANSWER: **triangular** matrix

[10] A square matrix is of this type if all of its entries are nonnegative and all of its columns sum to one. These matrices always have one as an eigenvalue.

ANSWER: **Markov** matrix [or: **stochastic** matrix]

17. A morale-booster during this event was a photograph of an unscathed St. Paul's Cathedral surrounded by smoke. For 10 points each:

[10] Name this Nazi German bombing campaign designed to weaken Great Britain in preparation for a land invasion through Operation Sea Lion, which never materialized.

ANSWER: the **Blitz** [do not accept: Blitzkrieg]

[10] Operation Moonlight Sonata hit this munitions-making city during the Blitz, destroying a cathedral from the 14th century. The Peeping Tom legend arose for an 11th-century incident in this city.

ANSWER: **Coventry**

[10] Some British civilians during the Blitz used easy-to-assemble shelters named for this Home Secretary, who, like Arthur Greenwood, was defeated by Clement Attlee during the 1935 Labour leadership election.

ANSWER: Herbert **Morrison**

18. This list is often taught with the mnemonic TULIP. For 10 points each:

[10] Name this list of tenets which includes total depravity, limited atonement, and the preservation of the saints.

ANSWER: **Five Points of Calvinism**

[10] John Calvin's vision of a reformed church was implemented in this Swiss city, which essentially became a theocracy under Calvin and the other reform clerics.

ANSWER: **Geneva**

[10] Calvin and this reformer collaborated on the *Consensus Tigurinus*, which sought to bring Lutheran and Zwinglian views on the Eucharist closer together. He succeeded Zwingli as head of the Zurich church.

ANSWER: Heinrich **Bullinger**

19. Like Jan Dussek's piece of the same type and key, this E-flat major piece has its slow, second movement in the major key of the flattened submediant. For 10 points each:

[10] Name this piano concerto that redefined the cadenza's place in classical music by including a written-out cadenza in the opening of the first movement and forbidding the soloist from improvising a cadenza at the end of the first movement.

ANSWER: Ludwig van Beethoven's **Emperor Concerto** [or: Ludwig van Beethoven's **Piano Concerto No. 5** in E-flat major]

[10] The slow, second movement of this piece, Beethoven's only concerto for more than one instrument, is also in the key of the flattened submediant. The third movement of this piece is a Rondo alla polacca .

ANSWER: **Triple Concerto**, Op. 56

[10] Sviatoslav Richter disowned his dreadful recording of the *Triple Concerto* with David Oistrakh, Mstislav Rostropovich, and this longtime conductor of the Berlin Philharmonic. According to Richter, this Nazi prized the nauseating cover photograph, with this conductor posing artfully and the rest of us grinning like idiots , over the recording itself.

ANSWER: Herbert von **Karajan**

20. This novel was originally written in French, but portions of the original manuscript were lost, so it has been back-translated from Polish. For 10 points each:

[10] Name this Jan Potocki novel whose frame story is about Alphonse van Worden, who finds the title text.

ANSWER: *The **Manuscript Found in Saragossa*** [or: *The **Saragossa Manuscript**, **Manuscrit trouv      Saragosse***]

[10] Carolyn French and Nina Karsov made an exceptionally bad translation of this Polish author's *Trans-Atlantyka*. The Grove Press editions of his novels *Cosmos* and *Pornografia* were translated into English from French.

ANSWER: Witold **Gombrowicz**

[10] The Polish poet Ignacy Krasicki also did translations from French and this language, including the works of Theocritus and Hesiod.

ANSWER: ancient **Greek**